Prenatal feeding intentions versus postpartum feeding practices in HIV-exposed women on antiretroviral therapy: a cohort study

by

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PREAMBLE

Declaration

I, *Dr Claudine Van De Venter*, hereby declare that the work on which this dissertation / thesis is based on is my original work (except where acknowledgements indicate otherwise) and that neither the whole work not any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Candidate Details:

Signature: Signed by candidate Date: 25 March 2019

Dr Claudine Van De Venter

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Thank you to my supervisor, Professor Landon Myer, for ‘keeping me out of the weeds.’

My heartfelt appreciation and thanks to Tammy Phillips, Kathryn Manning and Ben Brown who despite their unimaginably busy schedules, still found the time and patience to answer my many questions. Thank you to Marion Bloch for encouraging me to enrol in and complete the Master in Public Health program. And lastly, thank you to Nazlie Farista and Adri Winkler, the unsung heroes of the Master of Public Health student cohort.

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Abstract

Introduction

The 2011 Tshwane declaration of support for breastfeeding in South Africa places strong emphasis on exclusive breastfeeding for HIV-exposed infants, overturning prior policy emphasising formula feeding. Prenatal feeding intentions of HIV-exposed women on antiretroviral therapy were compared to postpartum feeding practices. Factors associated to congruence of infant feeding intentions and subsequent practices were identified.

Methods

This prospective sub-study is nested within Phase 2 of the MCH-ART study. Five hundred and eighty-four women who consented to participate in Phase 2 (of a 3-phase study) were enrolled. Interviews took place at the Gugulethu Community Health Centre from July 2013 to December 2014 at late 3rd trimester and before seven days postpartum. Factors related with prenatal and postpartum characteristics were analysed to identify associations with congruence between infant feeding intentions and practices.

Results

The majority (81%) of the cohort had intended to exclusively breastfeed, 16% had intended to exclusively formula feed and 3% had intended to practice mixed feeding. By one week postpartum, 9% of women were exclusively breastfeeding, 2% were exclusively formula feeding and 90% were practicing mixed feeding. Congruence in the exclusive breastfeeding, formula and mixed feeding groups was 7%, 1% and 2% respectively. The risk of congruence in infant feeding intentions and practice was

significantly less in women who disclosed their HIV-exposed status to anyone compared to those who chose not to disclose (aRR 0.56, 95% CI:0.37-0.93).

Conclusions

Although most women intended to exclusively breastfeed, the majority practiced mixed feeding and disclosure affected congruence. This indicates that the model used to advise women about infant feeding even in a study setting was not successful. When advising HIV-exposed expectant mothers, their disclosure status should be asked about and accounted for. The results indicate that despite previous study findings in similar socioeconomic environments, prenatal feeding intentions did not predict postpartum practice.

List of abbreviations

ART:	**Antiretroviral therapy**
ARV:	**Antiretrovirals**
BF / BM:	**Breastfeeding / breast milk**
CI:	**Confidence interval**
CFR:	**Case report form**
CUMC-IRB:	**Columbia University Medical Centre Institutional Review Board**
EBF:	**Exclusive breastfeeding**
EFF:	**Exclusive formula feeding**
FF / FM:	**Formula feeding / formula milk**
HCW:	**Healthcare workers**
HIC:	**High income country**
IQR:	**Interquartile range**
LMIC:	**Low and middle-income countries**
MCH-ART:	**Strategies to optimize antiretroviral therapy services for maternal & child health: the MCH-ART study**
MF:	**Mixed feeding**
MOU:	**Midwife and Obstetric Unit**
MTCT:	**Mother to child transmission**
NGO:	**Non-governmental organisations**
PMTCT:	**Prevention of mother-to-child transmission of HIV**
SA:	**South Africa**
UCT:	**University of Cape Town**
UCT-REC:	**University of Cape Town Faculty of Health Services Research Ethics Committee**
UNICEF:	**United Nations Children's Fund**
WHO:	**World Health Organisation**

A. PROTOCOL

I. Candidate signature page

The signature below establishes my assurance that I will not deviate from the stipulations contained in this protocol and that this mini-dissertation will be conducted according to all that is stipulated within the protocol. This includes all statements regarding participant confidentiality. It also provides the assurance that all necessary requirements of the University of Cape Town's (UCT) Human Research Ethics Committee will be adhered to and followed.

I, as a candidate for the Master of Public Health, agree to conduct this study in full accordance with the provisions of this protocol. Publication of the results of this study will be governed by UCT policies.

Candidate Details:

Signature:  Date: 25 March 2019

Dr Claudine Van De Venter

II. Protocol summary

Title	Prenatal feeding intentions versus postpartum feeding practices in HIV-exposed women on antiretroviral therapy: a cohort study
Purpose	To investigate the prenatal infant feeding intentions in HIV-exposed women on antiretroviral therapy (ART) and their subsequent postpartum feeding practices on or before seven days postpartum.
Primary Objective	1. To compare HIV-exposed women's infant feeding intentions, expressed during pregnancy, with their actual feeding practices, evaluated postpartum.
Secondary Objective	1. To identify factors associated with congruence of infant feeding intentions and subsequent practices.
Design	A prospective cohort study on feeding intentions and practices nested in an observational cohort (Phase 2 of a three-phase study) investigating HIV infected pregnant women eligible for initiation of lifelong ARV therapy over two study measurement visits.
Study Site	The study was carried out at the Gugulethu MOU, Gugulethu Community Health Centre (CHC) in Cape Town.
Study Drugs	None

Study Population	HIV-exposed pregnant women attending prenatal services at the Gugulethu MOU, who consented to participate in Phase 2 of the MCH-ART study.
Number of Participants	584 enrolled women
Treatment	None
Study Duration	The study took place over two study measurements during Phase 2; one visit at late third trimester and one before or at seven days postpartum and used demographic data collected during Phase 1. The study took place from March 2013 to April 2014 (Phase 1 demographic enrolment data) and July 2013 to December 2014 (Phase 2 study visits).
Hypothesis	The presence of certain socioeconomic, demographic and clinical factors during the prenatal and postpartum phase may influence the congruency of infant feeding intentions versus practices.

1. Protocol synopsis

In South Africa, 30% of all women attending prenatal care are HIV-exposed making the shift from exclusive formula feeding (EFF) to exclusive breastfeeding (EBF), as per the Western Cape Department of Health's 2011 policy recommendations, a critical area for research. [1-2] Preventing mother-to-child transmission and increasing EBF incidence and duration could address the high infant mortality rate in South Africa (SA) and continued mother to child transmission (MTCT).

The analysis is part of the Strategies to Optimize Antiretroviral Therapy Services for Maternal & Child Health (MCH-ART) study based in Gugulethu, Cape Town. The overarching purpose of the MCH-ART study was to evaluate two different strategies for the delivery of HIV services and treatment to eligible HIV-exposed women who had initiated antiretroviral therapy (ART) in the prenatal period and to their HIV-exposed infants. [3] The key findings of the parent study were that delays in ART initiation were minimized and the initiation of ART by HIV-exposed women was greater in the prenatal period than the postnatal period when ART was integrated into prenatal care. [4] The feeding intentions in HIV-exposed women on ART and their subsequent postpartum feeding practices were not investigated by the parent study.

The proposed study will investigate the prenatal infant feeding intentions in HIV-exposed women on ART and their subsequent postpartum feeding practices on or before seven days postpartum. The primary objective will be to describe HIV-exposed women's prenatal infant feeding intentions at baseline and their postpartum feeding practices. The secondary objective will be to identify factors associated with congruence of infant feeding intentions and subsequent practices.

The study population will be approximately 600 HIV-exposed women who were enrolled for Phase 2 of the parent study and attended the Phase 2 prenatal study visit three (late third trimester) and postnatal study visit four (within seven days postpartum) at the Gugulethu midwife and obstetric unit between July 2013 and December 2014. [4]

It's acknowledged that breastfeeding has a risk of vertical transmission however not being breastfed increases HIV-exposed and HIV-exposed but uninfected infant's mortality risk. [5] In light of these factors, the proposed study has the potential to contribute to the knowledge base on infant feeding in HIV-exposed women and to the

maximization of benefits of infant feeding recommendations and strategies for maternal and child health in the South African context.

2. Introduction

2.1 Background

Over the last decade, there have been a myriad of policy changes that impact infant feeding practices both in the context of low and middle-income countries (LMIC) and prevention of mother-to-child transmission of HIV (PMTCT) interventions that will hopefully aid SA meeting United Nations Millennium Goals 4, 5 and 6 if HIV transmission and mortality can be reduced. [5]

In 2010, following the release of new guidelines by the World Health Organisation (WHO), clinical guidelines for PMTCT were updated in SA. Along with the recommendations regarding highly active antiretroviral therapy (HAART), the South African Department of Health and National AIDS council adopted breastfeeding (BF) as the new national infant feeding policy. However, the 2010 guidelines still recommended the provision of free formula milk for women who opted not to breastfeed. Women were still being offered the choice between EBF and EFF at public health facilities. This despite the fact that many who opted to EFF were (1) mixed feeding (MF) which leads to a greater risk of HIV transmission, and (2) the WHO's acceptable, feasible, affordable, sustainable and safe (AFASS) conditions which were required when recommending EFF were not being met. [6-9] Various PMTCT studies have shown that EFF and MF lead to higher early infant mortality yet slight difference in HIV transmission. [10-12]

In 2011, the WHO released recommendations that all infants, regardless of HIV status or exposure should be breastfed exclusively for six months postpartum. After six months infants born to HIV-exposed mothers should be fed complementary foods and continue to be breastfed until 12 months only. WHO recommended that these mothers and infants should be provided with ART or prophylaxis to reduce the risk of transmission through BF. In the same year, the Health Minister, Dr Aaron Motsoaledi, other health officials, WHO, non-governmental organisations (NGO), civil society and the United Nations Children's Fund (UNICEF) gathered at a conference where it was decided to promote BF and to cease formula distribution. The South African government adopted the Tshwane Declaration in 2011 as the national regulation promoting BF as the infant feeding policy for both HIV-exposed and non-exposed infants. [13] These policy changes tied in with PMTCT interventions, bringing BF into the area of high impact with regards to preventing infant mortality and HIV transmission. [14]

A disproportionate number of deaths in children under five globally occur in Sub-Saharan Africa (42%). Although there has been a decrease in infant mortality in SA, SA's infant mortality rate is higher in comparison to other LMICs with 34 infant deaths per 1000 live births in 2015. Infants who are breastfed at some stage during their first six months of life are six times more likely to survive than children who are not, and this increases to fourteen times in exclusively breastfed children. [15-17] A review by the Health Systems Trust indicated the leading cause of mortality in under five-year olds in 2000 was HIV and AIDs (40%), low birth weight (11%), diarrhoeal diseases (10%) and lower respiratory infections (5.8%), all of which could be improved by EBF. [18]

2.2 Background specific to the proposed dissertation

In 2010, 53% of infants less than six months of age in SA were being MF, many on foods that were unsuitable, unsanitary and of poor nutritional value. Identified as the most effective intervention for preventing mortality in children under five years, EBF is the recommended gold standard. However, the reality is that many mothers still choose to FF and MF and rates of EBF in SA are low. Ideally, to minimize the risk of HIV transmission as a minimum, MF should be discouraged and either EBF or EFF should be practiced. [19-22]

Successful implementation of PMTCT results in suppression of maternal viral load and acts as a prophylaxis to the infant during breastfeeding. But it relies on women choosing EBF over MF and FF and the removal of barriers to optimal and complementary infant feeding. Several studies both internationally and in Africa have investigated maternal infant feeding decision making in HIV-exposed women. [23-26]

2.3 Study rationale

2.3.1 Updated generalisable data

Given the importance of PMTCT in ART-eligible women, and the increasing importance of the postpartum period as a time of mother-to-child-transmission (MTCT) risk during breastfeeding, the proposed study has the potential to make a significant contribution to services that maximize the benefits of antiretroviral therapy for maternal and child health and to understand barriers present. Data collected during Phase 2 of the MCH-ART study would allow updated statistics relating to BF practices at one week postpartum in the Western Cape, as the cohort of women attending the Gugulethu MOU are thought to represent the larger population of women attending midwife and obstetric units in the Cape Flats.

2.3.2 Previous and current infant feeding practices and factors relating to congruence in the context of changing national policies

Previous infant feeding may influence how a woman chooses to feed in subsequent pregnancies, regardless of the dictates of policy changes. Thus far international studies have mainly focused on FF infants and have found that former infant feeding practices influence subsequent infant feeding choices strongly. [27] Therefore influencing primigravida HIV-exposed women to EBF or focusing more attention on re-educating multigravida women to EBF could benefit maternal and infant health. It's therefore important to ascertain congruence in both sets of women.

The Infant Feeding Practices Study II in the United States assessed women's expected BF duration and subsequent levels of satisfaction with their actual BF duration one year postpartum. [28] Most study participants did not meet their prenatal BF expectations and most expressed dissatisfaction with the postpartum BF duration. Factors associated with incongruence were return to work, being overweight and postpartum depression. Although women were unsatisfied with duration of BF, at one year postpartum, there were a greater number of women who although not BF, were satisfied with their BF duration and felt that they had met their expectations. [28] These results of poor recall of BF and EBF duration were similar to a study in 2003, which found that 48-hour recall of EBF was unreliable, but seven-day recall was more accurate. Researchers found that data should be collected early in the postpartum period and at weekly intervals. The MCH-ART Phase 2 postpartum study visit occurs within seven days of birth to increase accuracy of maternal recall of infant feeding practice. [29]

In 1998 the majority of SA HIV-exposed women were initiating EBF but only 10% were EBF at three months and 1.2% were BF at six months, although this was mainly MF. [30] The Development of Anti-Retroviral Therapy in Africa (DART) trial collected data on HIV-exposed women in Uganda and Zimbabwe from 2003 to 2009. The results indicated that regardless of what level of encouragement was given to women, only 40% BF for a short duration (median 94 days). [31] Subsequent studies in KwaZulu Natal and the Western Cape were carried out during the time of continued provision of free formula, where HIV-exposed women were being advised to either EBF or EFF. Results indicated that at one to two weeks postpartum, the greatest reasons for changing from their original EBF feeding intentions was advice from healthcare workers (HCW), a fear of the association of FF with HIV threatening women's non-disclosure status and pressure from family members to introduce other liquids to infants. A third of women had introduced formula or other fluids within the first three days postpartum. Factors leading to early cessation of BF and subsequent incongruent infant feeding practices were prenatal intention not to BF and being unsure as to their intended infant feeding method. Breast health problems were associated with a three-fold risk of incongruent feeding practices in those intending to EBF and being financially independent with a two-fold risk. For those who changed from EFF, the reasons were insufficient supplies and shortfalls of formula, and the lack of resources such as a kettle, electricity and a lack of cash resources. [19, 30] Both studies were carried out in the context of HIV-exposed women being pressurised to not BF. From 2011 EBF was recommended for all HIV-exposed infants and the MCH-ART study in Gugulethu was carried out within this context. It would be important to ascertain if any changes to factors relating to congruence occurred after the release of the 2011 Tshwane Declaration and subsequent policy change.

This proposed study, based on the data collected during the MCH-ART study would also scrutinize an earlier period (prenatal period) than other studies previously have.

This could lead to the identification of new factors, and subsequent interventions could be aimed at encouraging EBF and or a non-MF regime based on the reality of women's feeding intentions through to their practices.

2.3.3 Identifying key factors associated with congruence in infant feeding choices

Considering increasing HIV exposure for infants due to increasing BF, it's critical to establish what factors are associated with congruence with feeding intentions versus practices, especially in those women who intend to EBF or EFF. Identifying key factors aimed at encouraging EBF or non-MF have the potential to improve infant feeding strategies for HIV-infected women. To date, most research exists regarding infant feeding decision making or feeding intentions or practices. There is a scarcity of data investigating both feeding intension and practices together and the factors that would influence congruence between the two.

Considering the above, there is a clear need for research to identify optimal strategies primarily for implementing EBF and ensuring its continuation.

3. Study aims and objectives

3.1 Study aim

The overall aim of this study is to investigate congruence in infant feeding intension versus practice in a cohort of women who initiate antiretroviral therapy during pregnancy.

3.2 Objectives

3.2.1 Primary objective

To compare HIV-exposed women's infant feeding intentions, expressed during pregnancy, with their actual feeding practices, evaluated postpartum.

3.2.2 Secondary Objective

To identify factors associated with congruence of infant feeding intentions and subsequent practices.

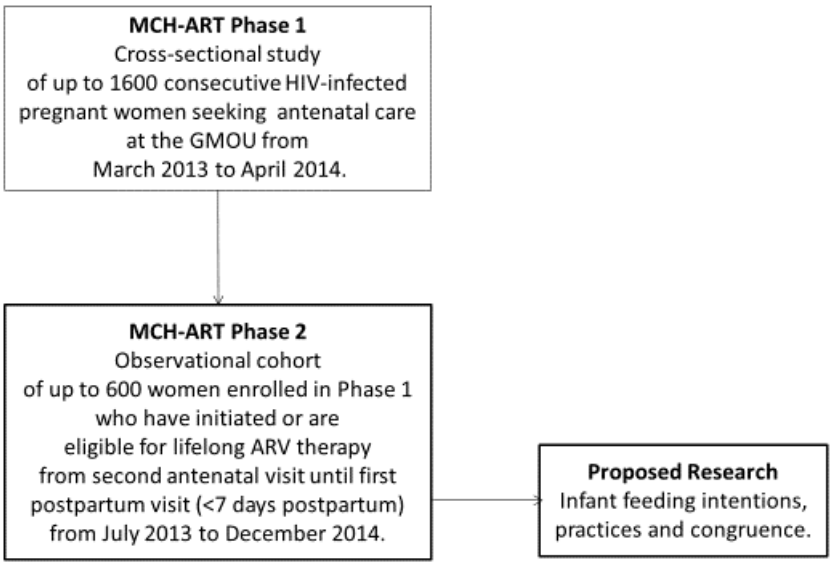
4. Methods

4.1 Study design

This study proposes to investigate data collected on up to 600 women enrolled in Phase 2 of the MCH-ART study; an observational cohort of women who attended the Gugulethu MOU ART service from July 2013 to December 2014. [4] These women, according to the local public sector guidelines in 2009, were eligible for or had already initiated lifelong ART therapy. [7]

This prospective cohort study will analyse data collected at their late third trimester prenatal clinic visit and their first postpartum visit (scheduled within seven days postpartum) along with demographic data collected during Phase 1 of the MCH-ART study. Women from Phase 1 of the MCH-ART study were consented at their second prenatal clinic visit; questionnaires were used to collect study measures at their late third trimester visit, and again at their first postpartum visit (Fig A1).

Fig A1. Schematic positioning proposed secondary analysis of data from the MCH-ART parent study



The study methods described below refer to the MCH-ART study, which is the source of the data that this secondary data analysis proposes to study.

4.1.1 Expected time frame for completion of the proposed study

Table A1 describes the expected times for completion of the proposed study with the intention to submit in August 2017.

Table A1. Time schedule for completion of MPH dissertation

Months - 2017	March	April	May	June	July	August
Literature review						
Data management						
Data analysis						
Results						
Discussion						
Final write up						

4.1.2 Referencing style

The Vancouver style of referencing based on manuscript requirements for section C will be used throughout the proposed study, including this protocol. Mendeley Version 1.19.3 (Mendeley Ltd., Elsevier, Amsterdam, Netherlands) will be used as the bibliographic software.

4.2 Study site

The proposed study site where data was collected during the primary study (MCH-ART study) took place at the Gugulethu Community Health Centre (CHC) in Cape Town, South Africa. Approximately 4900 women sought prenatal care or delivery services at this MOU in 2010 where PMTCT services have been offered since 2001. The MTCT rate (based on PCR results at six weeks) was estimated to be two to four percent during the study period. The Gugulethu MOU provides services for patients from the Gugulethu, Philippi, Nyanga, Heideveld, Lower Crossroads areas and the Eastern Cape. [32]

4.3 Study population and sampling

Phase 2 participants were a subsection of enrolled phase 1 participants who were HIV-exposed women attending prenatal care the Gugulethu MOU. The Phase 2 participants were those eligible to initiate ART.

4.3.1 Inclusion criteria

Participants needed to have been consented and participated in Phase 1 of the MCH-ART study and to have been able to provide consent into Phase 2. Women had to be eligible for and or initiated ART or have started AZT for PMTCT at the Gugulethu MOU in their current pregnancy and if already receiving lifelong ART must have been non-compliant for at least six months.

4.3.2 Exclusion criteria

Participants were excluded if they were not pregnant at enrolment into Phase 2, intending to relocate out of Cape Town during the study period, or refused to take ART, or if they were in denial of their HIV-exposed status. They were also excluded if the investigators thought that the participant suffered from any medical, psychiatric or social condition that would affect their ability to consent or participate in the study. An additional exclusion criterion will be added to the MCH-ART Phase 2 exclusion criteria; participants who have missing data for study visit four due to infant death or miscarriage will be excluded.

All MCH-ART Phase 2 participant data will be included in this study based on convenience sampling and there will be no direct contact with any participants for this research.

4.4 Recruitment and enrolment

In the MCH-ART study, study staff approached Phase 1 participants who met the eligibility requirements in section 4.4 to participate in Phase 2. Those who agreed to participate were re-consented by written informed consent. Participation in Phase 2 did not impact any of the participant's routine visits at the MOU (i.e. prenatal and obstetric visits).

4.5 Participant retention

Locator information was collected at enrolment into Phase 1 and updated at subsequent visits. This information was locked away in study cabinets and was accessible only by permission of the study coordinator. Tracing of participants who missed study visits was through telephone contact or home visits by fieldworkers. Fieldworkers and study staff employed by the MCH-ART study were regarded as highly experienced, knowledgeable about the local community and able to ensure participant confidentiality during tracing activities. At enrolment, participants were educated on their right to refuse to participate in a study visit or withdraw from the study at any time during the study period. At enrolment and during any study visit, participants who were not using ART were urgently referred to the relevant services.

5. Study procedures

Existing data collected during the MCH-ART study will be used to carry out this secondary data analysis therefore there will be no direct contact made with participants during this prospective analysis of cohort data. However, a summary of study procedures carried out during the parent study is described below.

5.1 Study visits

This proposed secondary data analysis is seeking approval to use existing data collected by the parent study at Phase 2 study visit three and study visit four, along with demographic data collected at the first study visit of Phase 1. Study visits at which the existing data was collected were carried out separately from routine prenatal care and ART services offered at the Gugulethu MOU. BF counselling was offered at every prenatal visit; all women were encouraged to EBF for six months. All Phase 2 participants were required to make a routine visit at the Gugulethu MOU within seven days postpartum. Phase 1 study visits lasted approximately 20 minutes. Phase 2 study visits lasted between 30 and 45 minutes.

5.2 Referrals

Any women found to have unmet health needs during a study visit was referred to the relevant services, either at the Gugulethu MOU if available there or to higher levels elsewhere. This will include referrals to ART services for ART defaulters and non-adherent participants, referrals to an NGO and the SA police service for participants experiencing any form of domestic or partner violence.

5.3 Staff training

Multiday training over approximately one week regarding the implementation of study procedures at consent, enrolment and all study visits was provided to study staff that came into contact with participants. Refresher training was provided throughout the duration of the study. Specific training for crisis management, referrals and patient confidentiality was also provided.

6. Risks and benefits

6.1 Risks

As this is a secondary data analysis, there will be no direct risk to participants. The MCH-ART study from which the data will be sourced, identified risks associated with the collection of data relevant to this proposed study. The risks identified were potential psychosocial distress caused when questions addressing socioeconomic issues, ART use and disclosure were asked. Risks due to loss of confidentiality were also identified due to the collection of personal and medical information and during participant follow up. The parent study did address these risks using specific procedures and conduct developed during previous HIV prevention studies carried out in Gugulethu.

6.2 Benefits

As there will be no direct patient contact during this secondary data analysis, there will be no direct benefit to participants. However, the indirect benefit through the identification of risk factors associated with congruence between infant feeding intentions and practice will be the potential improvement of prenatal and postpartum infant feeding strategies and policy, leading to greater reduction in risk for infant mortality and MTCT. By identifying the optimal strategy to increase congruence between EBF intentions and practices, this study has the potential to lead to improved infant feeding strategies for HIV-exposed women in Cape Town, the Western Cape Province and throughout South Africa.

7. Informed consent and reimbursement

7.1 Informed consent

The Phase 1 informed consent document outlined the purpose of the study, processes involved, risks, benefits and alternatives to participation and a reassurance that participation in the study would not affect the care participants received at the MOU. Participants were informed that their participation in the study was entirely voluntary. They were informed of their right to withdraw from the study at any time and that withdrawal from the study would not impact on their access to routine care at the MOU nor to their access to ART. Staff were trained to obtain informed consent as described in 4.6.2 above and followed a standardized script detailing the purpose of the study, prenatal and postnatal study procedures and the risks and benefits of participation in the study. The informed consent was provided in the participants' home language (isiXhosa).

Phase 2 used a separate informed consent form (Appendix A) for the subset of women eligible for enrolment in Phase 2 of the study and from whom data will be obtained for this proposed study. The document describes the overall purpose of the study and the study processes and procedures involved for Phase 2 during the prenatal and postnatal period.

7.2 Reimbursement

Participants were reimbursed by the MCH-ART study; R100 to compensate for time involved for attending the visit and any transport costs incurred, and at each subsequent visit they received R80 in grocery vouchers and R20 to compensate for transport costs incurred.

8. Privacy and confidentiality

In the parent study from which this data is to be obtained:

- All staff underwent training in confidentiality and related patient protection issues.
- All study related and patient related documents containing patient information were kept in locked cabinets either at the Gugulethu MOU or at UCT
- Anonymous patient identification numbers were used on all study documents in place of the participants name.
- Only informed consent documents, locator information forms and a study identification key contained participants names and identifying information. These documents were locked in secure cabinets and kept separate from other study materials and access to the documents was restricted to the study coordinator or principal investigator.
- No CFRs used to collect data contained patient names, especially those which reflected participant HIV status or information about ART use.
- Electronic records were maintained in password protected files and communication of study data electronically was through password protected encrypted files. The electronic data stored at UCT was and still is stored within a firewall protected SQL server.

Loss of confidentiality was only deemed acceptable in cases where study staff would have recognised that a participant was a threat to themselves, that there was a possibility of child abuse or neglect and procedures were in place to notify the proper authorities.

9. Data analysis and monitoring

9.1 Data extraction

Only data pertinent to the secondary data analysis will be extracted from the parent survey and analysed. The data to be used for this proposed study is contained in three case report forms (CRFs). (Appendix B)

9.1.1 Phase 1 – study visit one

This visit occurred after participants were recruited and consented into phase 1. Data to be analysed from this visit pertains to 22 questions regarding demographics and medical history. These questions contain information about age, sex, language, education, employment, income, their residence and facilities available at there, cohabitation, current and past pregnancy, participants HIV status and the status of previous children, relationships, disclosure status and any previous HIV prophylactic treatment.

9.1.2 Phase 2 - study visit three

This visit occurred at approximately 32 to 36 weeks gestation. Data to be analysed from this visit pertains to seven questions about infant feeding intentions, namely previous infant feeding experience and infant feeding intentions for the expected infant.

9.1.3 Phase 2 - study visit four

The visit took place within seven days postpartum and coincided with the participants' routine postnatal clinic visit which normally occurs between two to four days postpartum. Data to be analysed from this visit pertains to 22 questions about infant feeding practices, namely initiation of BF, infant feeding recalls, the use of infant

formula, and questions about infant feeding during periods of separation of mother and infant.

9.2 Definition of outcome and predictor variables

In the proposed study the outcome variable will be defined as congruence. Congruence will be a dichotomous outcome variable and will indicate whether a participant's infant feeding intentions were the same as their postpartum feeding practices.

The dichotomous outcome variable congruence will be defined as:
Congruent: agreement between infant feeding intentions and practices
Incongruent: disagreement between infant feeding intentions and practices

Infant feeding will be defined as either:
Exclusive breastfeeding (EBF): infant will be fed breast milk only with the provision of no other oral substances except for drops or syrup consisting of prescribed vitamins, mineral supplements or medicines.
Exclusive formula feeding (EFF): infant will be fed formula milk only with the provision of no other oral substances except for drops or syrup consisting of prescribed vitamins, mineral supplements or medicines.
Mixed feeding (MF): Infant will be fed any combination of the following:

- breast milk and formula milk
- breast milk and any other liquids including formula milk
- breast milk and any other liquids not including formula milk
- formula milk and any other liquids including breast milk
- formula milk and any other liquids not including breast milk

Potential predictors are variables identified via literature review a priori to analysis or during data exploration and are factors associated with the increased or decreased risk of congruence. Potential predictor variables are variables associated with demographic and socioeconomic factors, previous infant feeding practices and duration, prenatal infant feeding intentions and postpartum feeding practices such as cultural practices, infant feeding during the first three days of life, reasons for early cessation of BF, breast health problems, formula milk supply issues, exposure to advertising promoting formula feeds and postpartum separation from infants.

9.3 Analysis and monitoring

Data relevant to this study will be extracted from the MCH-ART database into Stata version 14.0 (Stata for Windows, Stata Corporation, College Station, Texas). Analysis will be carried out under the supervision of this candidate's supervisor.

Data exploration will be carried out using univariate and bivariate descriptive statistics. Histograms will be generated for continuous variables and tabulations and cross-tabulations for categorical variables. Based on their distribution, continuous covariates will be analysed using medians and inter-quartile ranges (IQRs) or means and confidence intervals (CI). Frequency distributions will be used to describe binary and categorical covariates.

The cohort will be characterized by infant feeding intentions and practices using descriptive statistics; percentages and 95% confidence intervals (95% CI) for categorical variables and means and IQR for continuous variables. (Primary objective) The associations between exposure variables of interest will be compared to the primary outcome (congruence). For bivariate analysis of categorical variables, Fisher's

exact test or Chi-squared will be used to analyse the strength of association. Wilcoxon rank sum test will be used to compare continuous variables between groups.

Log-binomial regression will be used to calculate the adjusted relative risk and identify predictors of congruence (a dichotomous variable) of infant feeding intentions and subsequent practices. (Secondary objective)

Potential confounders and mediators will be identified prior to model building. All covariates for which there is a significant effect on the outcome or other covariates when removed will be retained in the final multivariate model. Model diagnostics will be run on the final model used for analysis and the outputs will be expressed as adjusted relative risk (aRR) with 95% CI. A P value of less than 5% (0.05) will be used where appropriate.

10. Data management

Data that will be obtained for this secondary data analysis will be maintained in an encrypted, password protected Stata file, in a firewall protected server which is backed up daily. Any analysis and output generated from this data will be maintained as above. No participant names or identifiers will be included in this dataset.

11. Ethical considerations

The parent study's protocol, all informed consent forms and data collection tools (CRFs) and other relevant documentation were reviewed and approved by the Columbia University Medical Centre Institutional Review Board (CUMC-IRB) and the

University of Cape Town Faculty of Health Services Research Ethics Committee (UCT-REC). (Appendix A - C)

12. Publications from this research

Any publications or presentations from this study will be agreed upon in collaboration with this student's supervisor, Professor Landon Myer**.**

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B. LITERATURE REVIEW

1. Overview of literature review

The aim of this literate review is to provide a comprehensive, but not exhaustive overview of breastfeeding (BF) globally and locally in the context of HIV. The review will be used to describe existing knowledge about BF intent, practice, and congruence between intent and practice in HIV-infected women as this is the central subject of this thesis. Formula feeding (FF) and mixed feeding (MF) will be discussed where relevant. Throughout this review, 'HIV-infected women' and 'women' will be used interchangeably to refer to HIV-infected women or mothers.

1.1 HIV and antiretroviral therapy

An estimated 12 million human immunodeficiency virus (HIV) infected women of reproductive age were living in Sub-Saharan Africa and 3.3 million (over 21%) living in South Africa (SA) in 2011. [1] In 2010, eight million people were accessing antiretrovirals (ARVs), increasing to 19.4 million in 2016 and 21 million in 2017. In 2017 in the eastern and southern region of Africa there were 19.6 million people living with HIV, of which 800 000 were new infections and 12.9 million people were accessing treatment. [2-3] In the Western Cape, the HIV prevalence was lower than the national percentage at 12.4% in 2015 to 2016 with women still being disproportionally affected. [1,4] SA began its national antiretroviral therapy (ART) program in 2005 resulting in just over 36% decrease in acquired immunodeficiency syndrome (AIDS) related deaths from 2007 to 2017. [2-3]

1.2 Prevention of mother-to-child transmission

The percentage of women who are receiving ART has increased from 47% in 2010 to 76% in 2016. In 2017, 80% of pregnant HIV-infected women had access to ARVs

through the prevention of mother-to-child transmission (PMTCT) programs. In eastern and southern Africa 93% of pregnant women were accessing PMTCT. In SA approximately a fifth of women between the ages of 15 to 49 years are HIV-infected. [3] PMTCT has been implemented internationally and in SA to establish a pregnant women's status, to engage HIV-infected women into care and promote ideal infant feeding. [5]

In 2013, between 1.3 and 1.6 million pregnant women from low and middle-income (LMIC) countries were infected with HIV. [6] Option B+ guidelines released in 2013 by the World Health Organization (WHO) recommend that in LMIC, lifelong highly active antiretroviral therapy (HAART) be adopted for all HIV-infected pregnant and BF women regardless of their cluster of differentiation four (CD4) count. Regardless of how HIV-infected women choose to feed their infants, all HIV-exposed infants receive daily antiretroviral prophylaxis, usually from birth to six weeks of age. [7] In 2013 SA adopted Option B and changed their PMTCT guidelines so that women with CD4 counts above 350 cells/mm^3 would discontinue HAART after BF cessation. The Western Cape guidelines were more progressive, stipulating that all pregnant and BF HIV-infected women would be eligible to continue lifelong HAART (Option B+) irrespective of their CD4 count. Option B+ was only adopted nationally in 2015. [8]

In the absence of ART, 5% to 20% of infants breastfed by HIV-infected women become HIV-infected through BF. [9] Studies have shown that mother-to-child-transmission (MTCT) can be virtually eliminated by the use of ART during pregnancy, with a less than two percent transmission in Sub-Saharan Africa. [10-11] However, due to non-adherence to ART the risk of vertical transmission remains greater than the two percent in some cases. [12-13] A continued concern is infants' long-term low dose exposure to ART through BF which can lead to the development of drug resistant viral mutants, HIV resistance and drug toxicity. [14]

1.3 Breastfeeding

SA is one of the 34 countries that account for 90% of the global burden of undernutrition. [15-16] One of the nutrition specific interventions investigated to address undernutrition in infants and good nutrition in the first 1000 days of life is BF. [15-16] BF is a high impact, cost effective intervention, especially for HIV-infected mothers in low socioeconomic settings. [7] Suboptimal BF or FF contributes to the increased risk of infectious diseases, stunting and can lead to early morbidity and mortality. BF also influences adult health and intelligence. [16] Stunting is the most common nutritional disorder in South African children affecting over 25% of children between birth to three years. Due to better access to care in Cape Town, the infant mortality rate is lower than the national rate. [17] The South African EBF rate for infants less than and including six months of age increased from 7% in 1998, to 8% in 2003 and to 26% by 2008. True BF practice may be inflated as some studies report the cumulative EBF rate or prevalence indicator which is the percentage of infants less than or equal to six months who are exclusively breastfed at some point in time. [18]

Up until 2010, the infant feeding recommendation for HIV-infected mothers was to either EBF or FF with the provision of formula by public health care facilities until infants were six months old. [19-20] In South Africa, a developing country, the lack of access to safe drinking water made FF unsafe. FF was recommended by WHO where acceptable, feasible, affordable, sustainable and safe (AFASS) conditions were present. [20] In 2011, the Tshwane declaration of support for BF in South Africa saw the adoption of the 2010 WHO infant feeding guidelines. The Declaration recommended EBF for six months, BF up until 12 months postpartum and ART for all HIV-infected mothers. The biggest change in policy could be found in the newly

implemented Baby Friendly Hospital Initiative (BFHI) in public and private health care facilities. Infant formula would no longer be freely available to HIV-infected mothers unless by prescription. [21] Infant feeding practices in SA differ from practices in the rest of Africa as FF is normative and BF rates are very low, below the global goal of at least 50% for infants up to six months. [17-18] PMTCT and Option B+ in 2013 in the Western Cape and nationally in 2015, recommended EBF for six months, then continued BF up until 12 months. [7,9,22] In 2018, the Western Cape updated guidelines recommend EBF for six months, then up until 24 months. [23] EFF feeding is being supported for those who decide not to EBF, although free formula is not routinely available to these women. If women are on ART, MF is considered a better option than not BF at all and women are encouraged to BF for as long as possible, even if not for 24 months. [23] BF is still not recommended in high income countries because of the risk of transmission even for women who are virally suppressed. [14] Unlike blood, safe viral thresholds for breast milk (BM) (undetectable, therefore untransmittable) have still not been established especially in the presence of breast infections, which increase viral shedding into BM. [14]

2. Literature review

This dissertation investigates infant feeding in the context of HIV. It explores prenatal infant feeding intentions and postpartum feeding practices, focusing on factors that lead to congruence between a mother's intentions and practices. To inform this research, the objectives of this literature review are:

- To describe existing research regarding prenatal and postnatal infant feeding intentions and practices in HIV-infected women.
- To identify factors that lead to congruence between infant feeding intentions and practices in HIV-infected women.

- To identify barriers to congruence between HIV-infected women's infant feeding intentions and practices.

2.1 Literature search strategy

A literature review was performed in order to describe infant feeding intentions, practices and factors that lead to congruence between the two in HIV-infected women internationally, in Africa and Sub-Saharan Africa from 1990 to date. The initial search was conducted on 9th September 2016 and references were updated on the 22nd March 2017 and 18th July 2018. The literature search strategy is summarised in Table B1. Articles were exported to the Mendeley reference manager software, version 1.19.3. Titles and abstracts identified by using the search terms above were screened for inclusion and exclusion criteria and duplicates removed. A total of 225 articles were identified as potentially relevant. After 27 duplicate articles were removed, there were 198 articles remaining. A full paper review was performed, and reference lists were reviewed for additional papers. One hundred and sixty-five articles were excluded leaving 33 remaining.

2.2 Inclusion and exclusion criteria

Included in the review were studies describing women's infant feeding intentions and or practices within a HIV-infected cohort or a cohort containing HIV-infected women. Samples could be derived from community, clinic or health care facility-based facilities. The following studies were excluded: a) studies of exclusively HIV uninfected women; b) studies which included women younger than 15 years; c) studies about infant feeding practices that did not include data about infant feeding from birth to one month. There was no exclusion based on whether the infant feeding intended or practiced was FF, BF or MF or whether the research was qualitative or

quantitative. Studies that did not include data about congruence between infant feeding intentions and practices were not excluded.

2.3 Quality criteria

The Equator Network reporting tools, the Strobe, Consort and Prisma checklists, were used to assess the reporting quality of included studies. [24-26] The CASP Appraisal Checklists were used to assess the validity of research findings where necessary as well as any weaknesses of the research. [26]

3. Prenatal feeding intentions in HIV-infected women

Certain factors have been identified that are associated with infant feeding intentions. Factors appear to differ based on whether the intentions were to BF, EBF, FF or MF. Environmental, social and contextual factors influence a HIV-infected women's feeding intentions as presented below.

3.1 Prenatal intention to EBF or BF

The percentage of HIV-infected women who intend to practice BF or EBF appears to differ depending on locality and the in-situ national infant feeding policy, specifically the provision of free infant formula by PMTCT programs. [27-30] Where there was no free infant formula provisioned to women, factors associated with infant feeding intentions were related to the affordability of formula and disclosure. [27-28,31-32] Factors associated with infant feeding intentions where free formula was provisioned by the PMTCT programmes were women's level of education, their experience of

infant feeding counselling and their beliefs about BF. [27-29] Their partner's awareness of their HIV-infected status and whether a woman knew her partner's HIV status were also associated with infant feeding intentions. [27-29] In free formula settings, women who intended to BF were more likely to have been recently diagnosed, to live in formal housing, to have had access to running water and have received prenatal BF counselling. [30] Research indicates that the provision of free infant formula leads to decreased EBF intentions, especially where a previous infant has been FF. In non-free formula provision settings such as India, Nigeria and Malawi, a greater number of women expressed intentions to EBF for between four to six weeks. [27] Nigeria offered a choice of EBF or EFF for HIV-infected women. However, formula had to be purchased resulting in a relatively high 68% of women intending to EBF. [28]

In Cote d'Ivoire and SA where free formula was provided, fewer HIV-infected women intended to EBF, especially if they had FF an infant previously. [27] [29] Previous FF experience could mean they were less likely to be influenced by updated PMTCT counselling to EBF. However, research findings are not consistent. Over 90% of Kenyan women intended to EBF although free formula was accessible through PMTCT programs. [33] This contrary result could be explained by the younger age of participants and most were primigravid. [33] Infant related factors, fear of transmission and education were identified as associated with BF or EBF feeding intentions. [30,34-35] Namibian, Swazi and South African women from KwaZulu Natal, the Western Cape, Eastern Cape and Gauteng expressed their intention and preference for BF for up until two years postpartum. [35] Infant health and bonding were reasons given for this. Contrary to this, the same sample of women confirmed that if they had the financial means, they would choose to FF to avoid the possibility of transmission via BF. [35] This sentiment is mirrored in other studies. [30,34] The more educated women were, the shorter their duration of intended EBF was. [27] It's

thought that better educated women were able to afford to purchase infant formula and therefore eliminate the risk of vertical transmission by avoiding EBF. Greater numbers of infant feeding counselling contacts are positively associated with EBF intentions, regardless of access to free formula or whether these contacts were with a health care worker (HCW) or someone else influential to them who supports EBF. [29-30,36-37]

The period of data collection in research is just as important as when infant feeding counselling takes place. This is because women were more likely to report intentions to BF in the prenatal period than women interviewed postpartum. [28,30] This tendency could reveal recall bias in women who had practiced MF or EFF. Participants were recruited up until two years after delivery. [33,37-38] Participants may not have been able to accurately recall their prenatal BF intentions and therefore less likely to report intention to BF if they had never BF. Response bias may have made prenatal women more likely to report intention to BF, especially if they had been newly diagnosed and received PMTCT counselling more recently. [33,37-38]

3.2 Prenatal intentions to FF or MF

Factors associated with intentions to FF overlapped with factors associated with EBF intentions. Infant related factors, disclosure, infant feeding advice, social factors and influential role players in infant feeding were found to be associated with intentions to FF or MF. [28,30,34-35]

HIV-infected women who intended to FF reported various reasons for their intention to FF. Some women wanted their HIV negative child to survive them or had previously had a child who had died and attributed the infant's death to HIV. Others had partners who dictated their infant feeding option. [35] Disclosure to their family or

significant others sometimes resulted in HIV-infected women intending to FF instead of BF. [28,39-40] These influential role players advised them to not BF due to their HIV-infected status. [28,39] HCW were also responsible for advising HIV-infected women to FF instead of EBF or MF. [28,30,34] The prevention of sexually transmitted infections (STI) forms part of PMTCT counselling provided by HCW. EBF to prevent HIV and STI reinfection includes condom use. [37] Many women reported that they could not negotiate condom use with male partners, hence they intended to FF. [35] Some HIV-infected women in SA intended to avoid BF due to their HIV status or poor maternal health. [18,34,40] The fact that EBF meant the exclusion of traditional medications, solids and water was a driver for women to intend to EFF instead of EBF. [36] The intended introduction of solids or liquids other than BM or infant formula due to cultural practices, beliefs about the adequacies of BF or a planned return to work could be categorized as an intention to MF. [35-36] The intention to MF in the form of a combination of FF and BF was not reported by any studies included in this literature review. It's clear from previous research the practice of MF by HIV-infected women commonly appears to be an unintended and incongruent infant feeding outcome, often based on practicality, necessity or coercion.

4. BF initiation in HIV-infected women

Just as the factors that are associated with prenatal infant feeding intentions differ, so do the factors that are associated with BF initiation. Despite the implementation of BFHI in an international endeavour to apply practices that protect, promote and support BF in healthcare facilities, there is still varying success in initiating BF within the first hour of birth in urban, peri urban and rural settings alike. [9,34,42-43] Before 2010, there were low rates of BF initiation in areas where Baby Friendly Hospital or Clinic environments were present. Sixty-six percent of Zambian women and

approximately 50% of Mpumalanga and the Western Cape in SA initiated BF within the first hour of birth. [9,41-42]

The timing of BF initiation differs which often effects the likelihood and timing of the introduction of risky MF practices. In rural Kenya and Malawi, the delay in BF initiation was often coupled with the early introduction of MF within three days postpartum and the early cessation of EBF. [33,43] Significantly fewer women introduced other foods and liquids if they had initiated BF within the first hour of birth. [43] Sixty-five percent of HIV-infected Malawian women initiated BF within the first hour of birth and five percent never initiated BF. [33] It's possible that initiating BF within the first hour of birth could be an important factor in congruence for women intending to practice EBF and the avoidance of MF practices. However, Siziba *et al.* [18] found that BF initiation within the first hour of delivery did not equate to a significantly increased chance of EBF being practiced in circumstances of premature delivery and for women who delivered at home. Approximately 5% of women who delivered at home were counselled to not initiate or practice BF by HCW. Despite the place of delivery, BF initiation within the first hour of birth is not only important to EBF. It's been found to increase the probability of survival in HIV-exposed infants. Infants who initiated BF two to 23 hours after birth had a 33% greater risk of mortality compared to infants who initiated BF within the first hour after birth. This risk doubled for infants who initiated BF more than 24 hours after birth. Therefore, initiation and timing of EBF is important to women and their HIV-exposed infants as the infant mortality rate in SA was estimated at nearly 40% in 2011 and 32,8% in 2017. [18]

5. Postpartum feeding practices in HIV-infected women

It's well established in the literature that the prevalence of EBF practice is higher in HIV-infected women than in HIV uninfected women although HIV-infected women had a significantly greater risk of stopping BF. [36,43] The self-reporting of EBF is complicated by the incorrect understanding of the definition. Many HIV-infected women MF believing that they are practicing EBF. [44] Clinic shortages, formula feeding revealing a mothers' HIV-infected status, the resultant stigma and higher infant mortality in FF, and greater HIV transmission rates due to MF are reasons that BF is the best infant feeding choice for HIV-infected women in SA. [8,34,45-46] Sub-Saharan studies showed that EBF by mothers on HAART or extended infant prophylaxis resulted in similar HIV free survival compared to FF infants. [8]

SA has very high BF initiation rates [75-97%] but low rates of adherence to BF recommendations and the early introduction of MF. FF is also normative in SA. This results in low rates of EBF, evident nationally and in the Western Cape. [9,18] BF is a cultural norm in SA however EBF is uncommon. EBF among the intervention arms of South African studies such as the PROMISE-EBF and Good Start revealed rates as low as 10% at six weeks to 28% at 28 weeks respectively. [4,47] Similar declines in EBF were evident in African studies with a high prevalence of MF. [33,42-43] At day three, 94% of participants in a Zambian study which collected data from 2001 to 2003 reported EBF and this reduced to 37% by 16 weeks. [42] Rural Kenyan women reported far lower rates of EBF in 2009; 14% reported EBF within the first six months and 34% reported moving from EBF to MF. In the Nakuru Infant Feeding Study, 71% of Malawian women were EBF at one week postpartum and this reduced to 25% by six weeks postpartum. [33] Fewer Kenyan HIV-infected women practiced MF overall,

fewer transitioned to MF within six months and were more likely to transition from EBF to FF or replacement feeding when compared to HIV uninfected women. [43] Similar to the Kenyan study, Malawian women were less likely to MF than HIV uninfected women. [33] This could be an indication that PMCTC programs do make a positive impact on infant feeding.

Regardless of counselling, many women are concerned about vertical transmission and FF, or cease EBF early to transition to the use of infant formula. [20,35,48] The MASHI study in Botswana revealed the strongest predictor of illness in HIV-exposed infants was the discontinuation of BF. [20] The early introduction of FF and MF is the norm in Cape Town. [18] FF and MF increase the risk of illness, malnutrition and decreases the infant's gut integrity making it more vulnerable to HIV infection. [20,35,49,50] Formula bottles have been found to contain faecal bacteria increasing the risk of infection. Poor formula preparation, over dilution and frequent shortfalls of formula at clinics further complicate FF as an infant feeding choice. [20] The protective effect of BM are due to the levels of pathogen specific immunoglobulins and innate immune factors which were found to be the same in HIV-infected and uninfected women. [51] Rollins *et al.* [49] found that the protective benefits of EBF was positively correlated with the duration of EBF. Despite having less access to water, sanitation, electricity and income than those who did not BF, BF infants in the study had better survival rates. [49] This proves that BF conferred a benefit and developed infant's immunity. Although counterintuitive, Zulliger *et al.* [30] reported postpartum women who BF to have a tap in their property compared to those who never BF. Studies in Kenya and Zambia found that larger household size, home births and perceived small birth size, primiparity, and maternal systemic illness significantly increased the risk of early EBF cessation. [43] Differing factors led to women practicing or avoiding EBF for the recommended six months despite shared infant feeding policies. [30,42-43] This implies that PMTCT policies and initiatives to

support infant feeding are ineffective if other factors associated with infant feeding, unique to each locality, are not addressed.

There was mixed success of PMTCT programs as some studies did not find HIV-infected women following advice. Poverty, influence from others and a lack of autonomy influenced whether women could follow policy derived infant feeding advice. [34,52] Due to poverty, the majority of the women in a study in Lusaka, Zambia chose to BF their infant as formula was not a financially viable option. [42] Infant feeding decisions were often made postpartum even though the majority of participants had initiated BF. [43] Zambian and Kenyan HIV infected mothers were more likely to practice EBF or EFF until weaning for the first six months than MF. [32,42-43] Successful assimilation and practice of EBF feeding counselling may have been more pragmatic in rural areas due to poverty. In SA and Tanzanian studies, women's infant feeding decisions were often heavily influenced by family members such as grandmothers, mothers or those who provide financial support to them. [35,53] Gewa *et al.* [43] found the opposite in Kenya where there was minimal involvement in infant feeding decisions by grandmothers and mothers-in-law. Where the national infant feeding policy included abruptly weaning the infant at four to six months, this reduced EBF. Women may need the grandparents or father's permission to wean an infant, and this would be difficult to obtain if the norm is later weaning. Married women were less likely to introduce other foods or drinks within the first three days postpartum. [35] This protective effect may be due to the added support provided by a partner who supported EBF and Kenyan cultural practices where women are expected to EBF. BF advice does appear to be effective in some circumstances, despite other factors being present which usually lead to BF avoidance.

The effect of infant feeding counselling and support before birth diminished after delivery. Despite HIV-infected women's intentions to practice EBF or EFF, MF was common. [30,34,36] Poverty, a lack of continued support for their infant feeding choice and infant feeding advice that was discordant to their belief systems diluted the effect of infant feeding counselling. A lack of funds meant those who intended to EFF were more likely to MF when they could not afford to purchase formula. [28] Women commonly gave pre-lacteal foods despite initially following exclusive feeding advice. [33] Kenyan and SA women most commonly gave water to infants in the first week of life to prevent dehydration. Plain, salt, sugar and gripe water given to infants within the first three days after birth was thought to prevent dehydration, constipation and cramps. Soft porridges were also commonly introduced. [35][43] There was a belief among SA and Tanzanian women that BF alone was not sufficient due to maternal undernutrition. [35][36] As a liquid, BM, formula and animal milk could not be considered as a sufficient source of food. [35] Real lack of BM production or perceived BM milk insufficiency can be attributed to maternal undernutrition and hunger, anxiety of infant hunger, separation from and lack of contact with infants. [18]

6. The influence of previous infant feeding practices on current intentions and practices

This section highlights how multigravid women fed their previous children impacts on their subsequent infant feeding intentions and practices, as well as the duration of subsequent infant feeding practice. [27,30,33,54] Kafulafula *et al.* [27] found that HIV-infected mothers in Malawi who had never given birth before were less likely to intend to EBF than those who had given birth before. This was opposite to findings in Nakuru, Kenya, where young, first time mothers were more likely to EBF than older women who had children previously. [33] This may be because younger women were

more likely to follow PMTCT advice than women who had previously fed an infant. Zulliger *et al.* [30] reported that previously feeding an infant strongly influenced women's current feeding practices. However, any experience with either their own or another women's HIV-infected child resulted in the participants being more likely to FF regardless of their prenatal infant feeding intentions.

As an extension of first-hand experience, women's mothers and grandmothers were often key influencers in their infant feeding. Their infant feeding practices and subsequent advice would influence their daughters and stepdaughters infant feeding practices. [35,39] This was especially true in the case of teenage HIV-infected mothers, where grandmothers were placed in the role of primary caregivers to infants and were therefore responsible for infant feeding. [39] Historical infant feeding policies will therefore still be influential in current infant feeding practices.

7. Infant feeding policy changes and the effect on infant feeding practice in HIV-infected women

Changes in infant feeding policies and guidelines do not simply equate to changes in infant feeding practice, especially where MF is the culturally accepted norm. From 2003 to 2009, the Western Cape, Gauteng and KwaZulu Natal were implementing differing aspects of infant feeding policy with varying success. [9,40,55] The BFHI had only limited success in increasing the initiation of EBF within the first hour postpartum and did not increase the duration of EBF. Home visits and social interventions were successful in increasing EBF practice rates and duration in low HIV prevalence settings. [9,55] Integration between hospital-based policy changes with community initiatives are needed to ensure increased EBF. It can be argued that changes in infant feeding policy will have a reduced impact on women due to familial influence making historical infant feeding policy the dominant policy practiced. As

previously described, HIV-infected women are often advised by their mothers or grandmothers who are considered overriding authority figures, thereby perpetuating historical, outdated infant feeding policies. [35,52] They will consult with them before following infant feeding advice given by HCW. [35]

The source and quality of information impact their infant feeding choices especially in the landscape of South Africa's rapid policy changes. [9,35,39,55] In high HIV prevalence areas, the effect of mass media and poor counselling dilute the effect of policy changes to improve EBF rates. [55] Prior to the Tshwane Declaration, the most common infant feeding practice in SA was MF, and the provision of free infant formula was blamed for the low rates of EBF in 2009. [9,39] During the transition from free to non-formula provision at public health facilities for PMTCT from 2011 to 2013, women received differing infant feeding advice which led to confusion and MF. Staff at the prenatal clinics recommended EBF to HIV-infected women but the recommendation from the antiretroviral clinics was to EFF. Infant feeding advice differed based on which healthcare setting and provider was giving the advice. [30] Common reasons for not BF in SA in 2013 were a women's HIV-infected status and maternal illness or poor health. [9,18] This implies that the Tshwane declaration resolutions may not have been put into practice effectively. [18] Policies besides those directly related to infant feeding influence infant feeding practice as well as the contextual and social factors in which infant feeding takes place. [39] The National Department of Education's 2007 policy guidelines recommend that pregnant teenagers remain in school but remain out of school for two years to care for their infants. Many teenagers return to school due to social circumstances, driving FF. It's evident that social factors are not easily overridden by policy changes alone. [39,56]

8. Disclosure and its relationship to HIV-infected women's infant feeding

Research has affirmed that disclosure is related to infant feeding practices especially during the crucially important first few weeks postpartum. [36,43] Studies have indicated that disclosure can be positively or negatively associated with EBF. [29-30,32,36,48] Disclosure varies between studies and ranges from 16.7% to 86%. The new infant feeding guidelines recommending EBF mean women can now avoid unwanted disclosure, the associated stigma and potential isolation that came with EFF and should be able to avoid MF. [29,30-32,39,35,43,52]

Doherty *et al.* [29] found that South African women from Paarl, Rietvlei and Umlazi who intended to FF were less likely to have disclosed their status to their partners. EBF was the cultural norm and only HIV-infected women EFF. This resulted in women ceasing EFF to begin BF upon discharge from hospital to avoid disclosure for fear of community ostracisation. Gewa *et al.* [43] found that disclosure was related to more partner involvement in infant feeding. Matji *et al.* [40] found that 79% of HIV-infected South African women in Tshwane townships had already disclosed their status at 28 weeks gestation. Disclosure was mainly to their partners (72%) and was significantly associated with women intending to FF. Onono *et al.* [32] found that disclosure rates amongst women in rural south Nyanza in Kenya were low (31.5%) where EBF is the cultural norm. Postpartum disclosure resulted in women being three-fold more likely to EBF than those who were HIV uninfected or status unknown. Zulliger *et al.* [30] reported that 77% of women had disclosed to their partner. Disclosure was higher than in other studies. The majority of women were not newly diagnosed. They may have had more time to assimilate their diagnosis which lead to increased disclosure. To avoid disclosure whilst EFF, Nigerian women told family

members they were experiencing milk supply issues, were taking medications that were harmful to the infant, and their BM was bad and had contributed to their previous infants' death. [28] In some South African studies, non-disclosure to their families and partners led to mothers choosing to EFF. This was to avoid the risk that MF by their family members and infant carers would result when separated from their infants. [29,35,39]

Drawing from the literature, the most desirable outcome for HIV-infected pregnancies is when women can disclose, are able to access medical care and psychosocial support, prevent transmission to their partners and infants and freely choose the infant feeding method which is most feasible to them. In order for this situation to exist, ideally (1) women would be diagnosed as early possible in their pregnancies or before, (2) be able to disclose to their significant others, (3) reside in areas where EBF is well established as the cultural norm and (4) is supported as the safest infant feeding method for HIV-exposed infants. This is more reason why SA needs to drive the replacement of MF as the cultural norm to EBF, which will further protect our society from HIV.

9. Congruence between infant feeding intentions and practices in HIV-infected women

There is very limited literature containing information on the factors associated with congruence between infant feeding intentions and practices. Relationship status and factors related to a HIV-infected women's level of education were found to be significantly associated to congruence as well as return to work, number of prenatal visits, disclosure to family and friends and a history of previous child death. [28-29,38,45]

A higher number of prenatal feeding counselling visits women received and support from study staff and NGOs was found to be positively associated with congruent infant feeding. [29,32,40,49,55] In an intervention to increase rates of EBF in a high HIV prevalent area in KwaZulu Natal, carried out from 2001 to 2005, found that four prenatal visits resulted in a threefold increased odds of EBF rates at four months compared to women who had fewer prenatal visits. [48,55] The study carried out in Nigeria had similar findings where women who had more than one infant feeding counselling session were more likely to practice congruent infant feeding. [28] Non-governmental organisation's counselling groups or research project staff's counselling sessions increased congruence as they provided access to equipment, free infant formula, individualised information, non-judgemental counselling and advice on how to manage relationships with partners and family. [38]

The choice of infant feeding intention and the in-situ national infant feeding policy appears to be associated with the probability of women practicing infant feeding which is congruent to their intentions. [28-29] Doherty *et al.* [29] studied women in Paarl, the Eastern Cape and KwaZulu Natal who had access to free formula during 2004 to 2005. The initiation and maintenance of EFF was more common than EBF and intention was significantly associated with congruence. In contrast to the above study, another study in Southwestern Nigeria found that HIV-infected women who intended to EBF prenatally had higher levels of congruence in circumstances where no free formula was provided by the PMTCT programs. In this case, those who intended to EBF were more likely to practice EBF postnatally. [28]

10. Barriers to exclusive breastfeeding and congruence in HIV-infected women

In order to practice congruent infant feeding, HIV-infected women require support, self-reliance, knowledge and competence to overcome barriers during crucial times in the early postpartum period. [7-9,29,35,40,43] A lack of support for optimal EBF from the community, HCW, family members and policy makers led to incongruence in EBF practice. [7,9,57] Where culturally accepted infant feeding norms were MF or EFF, this made EBF more difficult to practice. [18,20] Women who received less frequent home or clinic based infant feeding counselling sessions from HCW who imparted poor PMTCT information were less likely to EBF. [29,32,3840,47,58] HCWs advice played an important role in changing women's feeding practices from their original intentions and were pivotal in conveying messages about EBF lowering the risk of HIV transmission, and HIV transmission not being inevitable. PMTCT counselling in Kenya, Burkina Faso, Cameroon, Cambodia and SA was found to be inadequate in some studies. Understaffing, a lack of teaching resources and constantly changing infant feeding policy guidelines were blamed. [29,32,38-39,40,50,58] Access to free formula, the option to EFF along with EBF not being promoted in a high HIV prevalent area were identified as barriers to EBF and congruence. [9,40,57] Another unintended challenge to EBF is the South African government's protein-energy malnutrition scheme, the Integrated Nutrition Programme (INP), which was introduced in 1994 and supports formula milk (FM) as a source of protein for ages six months to five years. [20]

In addition to barriers resulting from policies and PMTCT service delivery, barriers to EBF and congruence were often related to maternal or infant health. Poor BF techniques and resultant breast infections, cracked nipples and abscesses, feeding

difficulties such as perceived BM insufficiency and low milk supply or an excessively crying, sick or a hungry infant led to MF and EFF. [7,28,35,42,55,59] Infant teething and bleeding nipples was a reason given by HIV-infected women for early cessation of EBF as they feared an increased risk of HIV transmission via their bleeding nipples to their teething infants. [59] HIV-infected women also thought that personal negative emotions or anger reduced their BM supply. [35] Kenyan, South African, Namibian and Swazi HIV-infected mothers reported that poverty related food shortages resulted in reduced or insufficient BM supply and EBF avoidance or early cessation. [35,43] Lack of finances, illness, family pressure, stigma, disclosure and separation from infants were reasons that many women moved in and out of feeding categories, swapping between EBF and EFF and MF. [28-29,35,44,59]

A lack of autonomy, confidence and financial independence were barriers to EBF and congruence in teenagers. Separation from their infants upon return to studies, peer pressure, social isolation, and vanity were also identified as barriers. Infant feeding decisions and rearing was carried out by mothers or grandmothers who would FF. [35,39] Infants whose fathers neglected their duties to provide formula or pay maintenance could be sent to fathers or their families if FF. [39]

11. Identification of gaps or needs for further research

This literature reviewed offers differing and sometimes conflicting outcomes as well as a vast diversity of the differing facets of infant feeding in the context of HIV infection. Studies included in this literature are summarised in Table B2. Depending on enrolment facility, the messages study participants received on infant feeding

differed. [30,38] Many studies were carried out during the period when FF was still freely provisioned by heath care facilities or during the phasing out period and therefore don't accurately account for current practices. [27-28,29] The number of studies that collect data on changes between intentions and practices is limited. The use of non-standardized definitions of infant feeding patterns makes direct comparison of studies more difficult. [29,42,44] Differing methodologies resulted in the inability to identify trends. [27,30,33,43-44] Small sample sizes was another potential limitation of some studies. [33,53,59]

Each region has different factors identified as influential to infant feeding intention, practice and congruence justifying the need for regional studies, such as in Gugulethu and the Cape Flats. This review emphasises the need for further research into the factors that affect infant feeding intentions and practices of HIV-infected women after change in the infant feeding policy in South Africa. Further to this, the proposed study aims to identify factors that are related to postpartum infant feeding practices meeting prenatal infant feeding intentions. The research will build on previous research on infant feeding in HIV-infected women. The research aims to inform the development of appropriate and opportune interventions to promote EBF and ensure that women do end up feeding their infants as they intended to.

Table B1. Summary of literature search strategy.

Electronic databases								
EBSCOhost and Sage		**PubMed**			**Scopus**		**Web of Science**	
Boolean connectors	**Search terms**	**Boolean connectors**	**Title / Abstract / Mesh**	**Search terms**	**Boolean connectors**	**Search terms**	**Boolean connectors**	**Search terms**
	South Africa			South Africa	OR	intent		South Africa
AND	Intent	AND		Intent	AND	Breast feeding	AND	intent
AND	Practice	AND		practice	AND	HIV	OR	intent
OR	Intent	OR		intent	OR	HIV	AND	practice
OR	Practice	OR		practice	OR	human immunodeficiency virus	OR	practice
AND	Breast feeding	AND	Title / Abstract	Breast feeding	OR	Acquired Immunodeficiency Syndrome	AND	breastfeeding
OR	Breast feeding	OR	Mesh	Breast feeding	OR	AIDS	OR	breast feeding
AND	HIV	AND	Mesh	HIV			AND	HIV
OR	HIV	OR	Title / Abstract	HIV			OR	AIDS
OR	human immunodeficiency virus	OR		human immunodeficiency virus				
OR	Acquired Immunodeficiency Syndrome	OR	Mesh	Acquired Immunodeficiency Syndrome				
AND	Acquired Immunodeficiency Syndrome	OR	Title / Abstract	Acquired Immunodeficiency Syndrome				
OR	AIDS	OR	Title / Abstract	AIDS				
Limited to	Full text articles, journal articles and academic journals, publication date 1990–2018	-	**Limited to**	Journal article, female, human, adult 19+ years	**Limited to**	Open access journals, title, abstract and keywords	**Limited to**	Articles, the topic of breastfeeding, the SCI-EXPANDED, SSCI, A&HCI, ESCI indexes and the following categories: infectious diseases, immunology, social sciences interdisciplinary, pathology, health policy services, obstetrics gynaecology, health care sciences

							services, sociology, multidisciplinary sciences, nutrition dietetics, psychology, psychology clinical, paediatrics, tropical medicine or nursing
Filters added for	"English" articles, "human", adults 19 years and older and "female" gender	-	**Filters added for**	-	**Filters added for**	-	**Filters added for**	Title for all terms except breastfeeding and breast feeding, which was limited to topic

Table B2. Summary of included studies.

In text citation	Author, year	Setting	Methodology, study design (sample size=n*)	Data collection period	Population	Outcomes measured	Key findings related to HIV+ women's infant feeding	Methodological issues
Reviews and summaries								
[20]	Doherty, 2011	Botswana, Kenya, South Africa, Malawi.	Summary of published literature	2003-2010	HIV-infected mothers	Mortality and morbidity associated with infant feeding by HIV-infected women	Avoidance of BF, BF rather than EBF increases risk of mortality and morbidity. Quality of PMTCT counselling poor. Provision of free formula created confusion for HIV-infected women and health care workers.	-
[60]	Tuthill, 2014	Thirteen Sub-Saharan Africa countries	Metasynthesis of sixteen qualitative studies ([n=920)	2000-2011	HIV-infected mothers in Sub-Saharan Africa	Identify overarching themes, commonalities, differences in infant feeding choices among qualitative studies with HIV-infected mothers in SSA.	Influences on EBF was mothers fear of transmission of HIV to infant. Barriers to EFF were stigma, disclosure and cost. Healthcare workers and family are essential to successfully EBF by providing support, advice, accurate information, skills, enhancing self-efficacy. Lack of support leads to MF. Support led to disclosure. South African mothers had greatest exposure to EFF as an option.	-

In text citation	Author, year	Setting	Methodology, study design (sample size=n*)	Data collection period	Population	Outcomes measured	Key findings related to HIV+ women's infant feeding	Methodological issues

Quantitative studies								
[28]	Adejuyigbe, 2008	Three hospitals, Osun State, Southwestern Nigeria (urban, peri-urban, rural)	Quantitative cohort study (n=84)	2004-2006	HIV-infected pregnant women from 28 weeks gestation	Infant feedings intentions and practices.	MF more common in women intending to exclusively replacement feed [ERF]. Pressure from family members, difficulty establishing BF, inadequate BM supply, non-disclosure, lack of funds and infant distress were reasons for MF. Intention to ERF was associated with disclosure. Women who disclosed, had a previous child death were more likely to ERF.	Self-selection bias; HIV-infected women voluntarily sought care, results not generalizable to the population at large.
[44]	Bland, 2003	Three clinics in KwaZulu-Natal, South Africa (peri-urban, rural)	Longitudinal observational study, quantitative (n=149)	1999-2000	HIV-infected and uninfected women from 30 weeks gestation at baseline	Validate data collection methods on duration of EBF.	Mothers recall overestimated duration of EBF. Forty-eight hour and seven day recall accurately reflects feeding pattern over the last 7 days.	-
[45]	Bland, 2007	Nine clinic, KwaZulu Natal, South Africa (rural, peri-urban, urban)	Cohort study, quantitative (n=2491)	2001-2004	HIV-infected and uninfected mothers	Infant feeding intentions, the appropriateness of choices given the resources available, women's adherence to these choices in the first postnatal week.	Intention to FF / EFF was associated with having clean water and being the main income provider. EBF intention was significantly associated with congruence. The number of prenatal visits was significantly associated to EBF or EFF and congruent practices of these feeding intentions.	-
[55]	Bland, 2008	Eight clinics, KwaZulu Natal, South Africa (rural, peri-urban, urban)	Non randomized intervention cohort study (n=2436)	2001-2005	HIV-infected and uninfected women	Factors which increase EBF rates for 6 months postpartum.	Receiving home support through scheduled number of EBF counselling visits from well-trained lay counsellors was significantly associated with likelihood of continued EBF.	Confounder; extremely high level of support may have resulted in low levels of MF being practiced by women with access to free formula who chose to EFF.
[42]	Chisenga, 2005	Clinics in Chilenje, Lusaka, Zambia (peri-urban)	Descriptive longitudinal cohort study (n=354)	2001-2003	HIV-infected and uninfected women at 32 to 34 weeks gestation.	Factors associated with women ceasing EBF before 16 weeks.	Primiparity, maternal illness, infant length at 6 weeks significantly associated with shorter duration of EBF.	Self-report bias; self-report of infant feeding practices. Participants may have reported what they thought researchers wanted to hear.
[50]	Doherty, 2012	Paarl in the Western Cape, Rietvlei in the Eastern Cape, and Umlazi township in KwaZulu-	Sub-group analysis of a community-based cluster randomized trial (n=999)	2006-2008	HIV-infected and uninfected mothers followed up from birth to 9 months	Determinants of early BF cessation.	Indecision about infant feeding practice and prenatal intention not to BF were associated with stopping BF by 12 weeks postpartum. Breast health problems [self-reported] and having her own income increased the risk of a HIV-infected women stopping BF at 12 weeks postpartum.	-

		Natal (urban and peri urban)						
[56]	Horwood, 2018	Ninety-nine primary health care clinics in11 districts in KwaZulu-Natal (urban, rural)	Multistage survey, quantitative (n=4172)	2014-2015	All care givers, HIV-infected and uninfected, 15 years or older with an infant aged 13 to 16 weeks	Describe infant feeding, describe determinants of BF and EBF at 14 weeks of age	Seventeen percent received no prenatal infant feeding counselling, 22% received no BF advice in hospital at delivery. 9.4% and 10.9% received a visit from community healthcare worker pre and postnatally. HIV-infected women were less likely to be currently BF, more likely to never begin BF than HIV uninfected women. High SES and education risk factors for not EBF. Higher SES, higher education, older age, return to work, school resulted in less BF. Return to work, school associated with less EBF. Advice from prenatal clinic, community, early initiation and assistance with BF and skin to skin contact was associated with EBF.	Recall / information bias; data collected at 14 weeks postpartum. Social desirability recall bias; women may have reported what interviews wanted to hear. Design effect at sample size calculation; potential clustering at clinic level.
[27]	Kafulafula, 2013	Queen Elizabeth Central Hospital Maternity Unit, Blantyre, Malawi (urban)	Quantitative, longitudinal, descriptive correlation study (n=110)	2009-2010	HIV-infected women at least 36 weeks pregnant a baseline	EBF beliefs, intentions, external influences. Significant predictors of prenatal intended duration of EBF and likelihood of EBF for six months.	High EBF intentions. Prenatal EBF intentions positively associated with positive beliefs, maternal education, disclosure of HIV status.	Convenience sampling; potential sampling bias. Sample may not be representative of the entire population. High loss to follow up; may have led to attrition bias.
[33]	Kamau-Mbuthia, 2008	Provincial General Hospital, Nakuru, Kenya (urban)	Observational prospective cohort study (n=280)	2004-2005	Known HIV status, asymptomatic mothers recruited at delivery	Infant feeding practices, factors associated with feeding choices, adherence to feeding recommendations.	High EBF intentions (90%). High BF initiation (65%). High EBF in first week postpartum (71%). Less than 10% EBF at 14th week. No factors significantly associated with EBF in first week. Younger mothers more likely to EBF at 6th and 10th week postpartum.	Convenience sampling; potential sampling bias. Sample may not be representative of the entire population. Recall bias due to long period between data collection visits.
[61]	Le Roux, 2013	Twenty-four Cape Town township neighbour-hoods (peri urban)	Cluster randomised controlled trial (n=1238)	2009-2010	HIV-infected and uninfected women approximately 26 weeks pregnant and their infants	Effect of home visits by community healthcare workers on maternal and infant well-being 26 weeks of gestation through the first 6 months postpartum.	Home visits resulted in HIV-infected women being more likely to use one feeding method for 6 months, and to EBF for 6 months.	Recall bias; delayed enrolment meant some participants had prenatal, post birth and six-month questions asked at six-month visit.
[40]	Matjie, 2008	Four prenatal	Prospective,	2003-2005	Newly	Prenatal feeding	Seventy four percent intended to FF. BF	-

		clinics in two Tshwane townships (peri-urban, rural)	longitudinal study (n=293)		diagnosed HIV-infected women recruited at 28 weeks gestation	choices and determinants of choices	intention was associated with lower active coping ability, less likely to have disclosed, twice as likely to be married and knowledgeable about HIV transmission through BF.	
[62]	Mnyani, 2017	Ten healthcare facilities in Soweto, Johannesburg, South Africa	Cross-sectional study, quantitative (n=370)	2014-2015	HIV-infected and uninfected pregnant women and postpartum women	Infant feeding knowledge, perceptions, and practices among both women with and without HIV.	HIV-infected women were more knowledgeable about safe infant feeding than HIV uninfected women. Healthcare facilities were the main sources of information. 64.9% HIV-infected women reported intention to EBF. Prior breastfeeding experience positively associated with EBF intention. Knowledge of safe infant feeding positively associated with EBF intention and practice. EBF perceived difficult. Cultural factors barriers to EBF.	Social desirability bias; interviews took place in clinics, may have been assumed a test of knowledge. Measurement bias; measurement tools were not translated into local vernacular hence errors in translation may have occurred.
[32]	Onono, 2014	Nine prenatal clinics, South Nyanza, Kenya (rural)	Post-hoc analysis (n=281)		HIV-infected and uninfected pregnant women and postpartum women	Effects of HIV knowledge and HIV status on EBF practices. Effect of psychosocial factors on infant feeding choices.	Factors significantly positively associated with EBF practice were delivery in a hospital, HIV-infected status, and disclosure.	Social desirability bias; BF practice was self-reported. Sample may not be representative of general Kenyan population.
[49]	Rollins, 2013	Nine prenatal clinics in 2 sites in KwaZulu Natal, South Africa (rural, peri-urban and urban)	Non-randomized intervention cohort study (n=2237)	2001-2005	HIV-infected and uninfected mothers and their infants until 18 months postpartum	Effect of EBF on infant morbidity and mortality.	Fewer acute, persistent and total diarrhoeal events in EBF infants than MF or non-BF infants. Mortality risk was significantly less in EBF infants by 12 months than in MF or non-BF infants. Shorter EBF duration increases risk of infant mortality than EBF for 5-6 months.	-
[9]	Rossouw, 2016	Tygerberg Academic Hospital, Western Cape, South Africa (urban)	Prospectus sub study nested in a pilot study (n=47)	2009	HIV-infected and uninfected mothers and their infants	Feeding practices and nutritional status of HIV-exposed and unexposed uninfected infants.	Low BF initiation rates. Adherence to BF recommendations low.	Possible misinterpretation of questionnaire, small sample size and confounders present [smoking and alcohol use].
[51]	Shapiro, 2007	Four sites in Botswana (rural, peri-urban, urban)	Case-control study (n=120)	2003	HIV-infected BF mothers and HIV uninfected mothers whose infant had significant diarrheal or	Differences in the immunologic integrity of breast milk from HIV-infected and uninfected women. Risk factors for poor infant outcomes.	No differences were detected in BM immunologic profiles of HIV-infected and uninfected women whose infants were either ill or well. Cessation of BF was the strongest predictor of illness.	Confounders; HIV-infected and uninfected infants received different treatments. HIV-exposed infants received prophylactic zidovudine for 6

					respiratory illness during the first 6 months of life			months, HIV-infected infants received cotrimoxazole, HIV unexposed and uninfected infants received none of the above. Small sample size; results not generalizable to population.
[18]	Siziba, 2015	Forty healthcare facilities in North West, Gauteng, Free State, Eastern Cape Provinces, South Africa	Cross sectional study (n=580)	2013	HIV-infected or uninfected mothers and/or caregivers of infants ≤ 6 months	Infant feeding practices of mothers and/or caregivers of infants ≤ 6 months.	BF initiated within first hour of birth most likely with full term delivery. Need to return to work, studies, mother's health status, perceptions of insufficient milk supply influence mothers infant feeding practices.	Bias; convenience sampling affect age distribution of infants included in study.
[47]	Thomlinson, 2014	Umlazi, Durban, KwaZulu Natal (peri-urban)	Cluster randomised controlled trial (n=3494)	2008-2010	HIV-infected and uninfected mothers	Effect of community healthcare workers home visits on 12-week postnatal outcomes, infant HIV-free survival, exclusive and appropriate infant feeding.	Intervention at 12 weeks postpartum doubled the rate of EBF. Intervention arm participants were more likely to attend their first prenatal visit. Significant increase in EBF for every additional home visit by healthcare worker.	-
[4]	Tuthill, 2017	Two clinics, Pietermaritz-burg, South Africa (rural)	Randomized controlled trial (n=68)	2014-2015	HIV-infected women between 28-42 weeks gestation	Impact of our pilot intervention to increase the likelihood of initiating and maintaining EBF and the feasibility of its design.	High levels of self-sufficiency significantly predicative of BF initiation and duration.	Social desirability bias; morning information sessions may have impacted women's answers. They may have answered what they thought was the correct answer.
[36]	Williams, 2016	Tumbi Regional Hospital, Chalinze Health Centre, Bagamoyo District Hospital, Pwani region, Tanzania (urban)	Quantitative, crossover pilot study (n=400)	2011	HIV-infected mothers with children younger than 18 months	Correlates of infant feeding.	Infant age, HIV status, disclosure to maternal grandmother significantly associated to EBF for infants less than 6 months old.	Recall biases and cognitive errors; prospectus daily log kept by mother. Mothers reported and actual compliance with diary keeping may differ.

In text citation	Author, year	Setting	Methodology, study design (sample size=n*)	Data collection period	Population	Outcomes measured	Key findings related to HIV+ women's infant feeding	Methodological issues
Mixed methods studies								
[48]	Aishat, 2015	Six clinics in Oyo, Southwest Nigeria (rural, urban)	Two stage random and systematic sampling, cross sectional study, quantitative and qualitative (n = 600)	2012-2013	HIV-infected women attending PMTCT services with infants 6 weeks to 12 months	Sociodemographics, knowledge of EBF, infant feeding practices, factors influencing EBF practice.	79% understood the definition of EBF. 61% practiced EBF. Reasons for EBF: fear stigmatization, prevents infections, healthcare workers influence. Factors associated with EBF: earning less, > 3 infant feeding counselling sessions, fear of stigmatization.	Self-report bias; self-report of infant feeding practices. Recall bias; participants asked to recall BF intentions and practices since birth between 6 to 12 weeks postpartum.
[43]	Gewa, 2011	Kisumu East district, Kenya (rural)	Cross sectional, quantitative and qualitative (n=346)	2009	Non pregnant mothers with infants between 4 and 24 months old	How well child feeding practices meet WHO guidelines on EBF and BF duration in presence and absence of HIV, identify determinants of child-feeding practices in HIV-infected and uninfected women.	Early BF cessation associated with home births, perceived small infant size at birth, larger household size. BF cessation associated with HIV-infected mother, overweight, >1 child under 2 years old. Higher SES associated with lower risk of cessation of EBF. Child feeding decisions often made postpartum. Poverty was barrier to EBF 0-6 months.	Recall bias; participants asked to recall BF practices since birth at 4 months postpartum.
[30]	Zullinger, 2013	Gugulethu, Western Cape, South Africa (urban)	Convergent parallel, mixed methods study (n=203)	2011	HIV-infected pregnant and postpartum women who had delivered a live infant within the past 2 years	Factors that currently affect infant feeding decisions; infant feeding practices, intentions and influence.	50% intended to BF, 22% ever BF. Running water within the home, residing in formal housing, BF advice were significantly associated with BF intention or practice. Previous infant feeding experience, protecting the infant from HIV and involvement of other care givers influence infant feeding intention and practice.	Participants interviewed at 1 time point only therefore unable to identify trends and influences on intentions and practices.

In text citation	Author, year	Setting	Methodology, study design (sample size=n*)	Data collection period	Population	Outcomes measured	Key findings related to HIV+ women's infant feeding	Methodological issues
Qualitative studies								
[35]	Buskens, 2007	Eleven low resource setting in	Qualitative study (n=278)	2003	HIV-infected pregnant women and	How women make infant feeding decisions.	Very early MF is the norm, traditional beliefs prevent PMTCT education from being adopted, BM is not believed to be	Snowball participant recruitment and convenience

		South Africa (KwaZulu Natal, Western Cape, Gauteng), Namibia (Windhoek, Oshakati) and Swaziland Mbabane) (urban, peri-urban, rural)			mothers up to 1 year postpartum, relatives, healthcare workers		‘real food’, mothers believe their BM and themselves are insufficient, traditional power differences prevent disclosure and condom use.	sampling; non-random selection, results not generalizable to the population at large with potential sampling bias.
[53]	Chaponda, 2017	Postnatal ward in Tembisa regional hospital in the Northern Service Delivery Region in Ekurhuleni, Gauteng (peri-urban)	Qualitative, explorative design (n=30)	2011	HIV-infected mothers recruited after delivery prior to discharge	Factors influencing infant feeding choices of HIV positive mothers.	Nurses, grandmothers, sisters and aunts significantly influenced the feeding choices of new mothers. Supplementary feeds were introduced at key intervals before 1 month, at 1 month and at 4 months due to beliefs that BM was insufficient.	-
[59]	Coetzee, 2017	Prenatal clinic in Jos, North Central Nigeria	Qualitative thematic analysis (n=37)	-	HIV-infected and uninfected women in their third trimester of pregnancy	Barriers to and facilitators of adherence to EBF.	Physiological issues and employment were barriers to EBF and social and financial support were facilitators of EBF.	Sample size small hence findings cannot be generalised. There was no date of data collection.
[38]	Desclaux, 2009	Mother and child health services in public health facilities, NGO and research development sites, Cambodia, Cote d’Ivoire, Burkina Faso, Cameroon and Kenya	Qualitative, observational study (n=2020)	2002-2007	HIV-infected women accessing PMTCT programs	Modalities of choice between feeding options and their determinants, the micro-social impact of choices, difficulties encountered by mothers in practice, the context of infant feeding.	Diversity of infant feeding counselling, social risk related to fear of stigma, cultural practices, economic access to substitutes affect infant feeding intentions and practices. Support from NGOs or research team increased congruence.	Recall bias; Data often based on recollections and may not report the actual encounters.
[34]	Doherty, 2006	Paarl in the Western Cape, Rietvlei in the Eastern Cape, and	Qualitative sub-study of a prospective cohort study (n=40)	2004	HIV-infected mothers who have been successful in practicing EBF	Normative infant feeding practices, infant-feeding decision-making, experiences of early	Exclusivity was greater in mothers who practiced EFF than EBF. Factors associated with exclusivity was ability to resist family pressure to MF, recall of information on transmission risk and MF.	-

		Umlazi township in KwaZulu-Natal (urban and peri urban)			or EFF	infant feeding practices.	Maintaining EBF was associated with supportive home environment and beliefs in the benefits of EBF. Maintaining EFF was associated with resources that made night feeding easier. Inadequate support by healthcare workers increased likelihood of MF.	
[58]	Dunkley, 2018	Regional public sector HIV treatment clinic, Mbarara, Uganda (rural)	Qualitative (n=20)	2014	HIV-infected postpartum women on ART who were participants in the Uganda AIDS Rural Treatment Outcomes [UARTO] cohort	Explore prenatal and postpartum experiences.	Women made infant feeding choices that differed from recommendations due to: (1) perception of conflicting recommendations on infant feeding; (2) fear of prolonged infant HIV exposure through BF; and (3) social and structural constraints shaping infant feeding decision making.	Sample size small hence findings cannot be generalised. Recall bias; interviews took place several months after delivery took place.
[39]	Ijumba, 2014	Durban township, KwaZulu Natal, South Africa (peri-urban)	Exploratory, qualitative sub-study (n=60)	2011	HIV-infected and uninfected mothers who were FF their <6-month-old infants, grandmothers, fathers.	Perceptions, understanding of, value placed on FF. Factors that drive FF.	Inadequate involvement of teenage mothers, grandmothers replacing mothers, fear of not practicing EBF for 6 months, high cost of formula, partners as formula providers lead to women practicing FF or practicing risky infant feeding.	Purposeful selection and small sample size; cotrimoxazole.
[52]	Jama, 2018	Two clinics, KwaZulu Natal, South Africa (rural, urban)	Longitudinal qualitative (n = 10)	2015-2016	HIV-infected pregnant women, 15-19 years old, after 36 weeks gestation.	Autonomy and infant feeding decisions amongst teenage mothers.	Often inappropriate infant feeding decision making made by older mothers once teenagers at home, teenagers not involved in infant feeding decisions, diminished autonomy. Barriers to ability to make infant feeding decisions were age and financial dependence. Barriers to EBF were returning to school and fear of BF in public.	Results not generalizable; qualitative methodology used means results are not generalizable.

*n - all participants in study, including but not limited to HIV-infected and uninfected women and their infants, care givers, healthcare workers, relatives.

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C. MANUSCRIPT

Prenatal feeding intentions versus postpartum feeding practices in HIV-infected women on antiretroviral therapy: a cohort study

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[§] This article is written according to the requirements contained in the instructions for authors for PLOS ONE. These instructions are included as Appendix E, following dissertation guidelines. Tables and figures are labelled according to journal guidelines but are embedded in the text as per dissertation guidelines. Supplementary tables and figures are labelled according to journal guidelines and are presented in Appendix D as per dissertation guidelines.

Abstract

Introduction

The 2011 Tshwane declaration of support for breastfeeding in South Africa places strong emphasis on exclusive breastfeeding for HIV-exposed infants, overturning prior policy emphasising formula feeding. Prenatal feeding intentions of HIV-infected women on antiretroviral therapy were compared to postpartum feeding practices. Factors associated to congruence of infant feeding intentions and subsequent practices were identified.

Methods

This prospective study is nested within Phase 2 of the MCH-ART study. Five hundred and eighty-four women who consented to participate in Phase 2 (of a 3-phase study) were enrolled. Women were interviewed at the Gugulethu Community Health Centre from July 2013 to 13 December 2014 at late 3rd trimester and before seven days postpartum. Factors related to prenatal and postpartum characteristics were analysed to identify associations with congruence between infant feeding intentions and practices.

Results

The majority (81%) of the cohort had intended to exclusively breastfeed, 16% had intended to exclusively formula feed and 3% had intended to practice mixed feeding. By one week postpartum, 9% of women were exclusively breastfeeding, 2% were exclusively formula feeding and 90% were practicing mixed feeding. Congruence in the exclusive breastfeeding, formula and mixed feeding groups was 7%, 1% and 2%

respectively. The risk of congruence in infant feeding intentions and practice was significantly less in women who disclosed their HIV-infected status to anyone compared to those who chose not to disclose (aRR 0.56, 95% CI:0.37-0.93).

Conclusions

Although most women intended to exclusively breastfeed, the majority practiced mixed feeding and disclosure affected congruence. This indicates that the model used even in an ideal study setting to advise women about infant feeding was not successful. When advising HIV-infected expectant mothers, their disclosure status should be asked about and accounted for. The results indicate that despite previous study findings in similar socioeconomic environments, congruence is difficult to predict.

1. Introduction

A third of women attending prenatal care in South Africa (SA) are HIV-infected and in 2010 there were 40 000 new paediatric HIV infections in SA. [1-4] For HIV-infected women who are antiretroviral therapy (ART) compliant, exclusive breastfeeding (EBF) is recommended. EBF for ART compliant women increases HIV free infant survival when compared to mixed feeding (MF) or formula feeding (FF). [2,4] Breastfeeding (BF) is a primary intervention to prevent infant mortality, enhancing infant nutrition. ART reduces the risk of vertical transmission from 25% to less than 2%. [2,5-6] South Africa has been progressive in adopting international guidelines for HIV-exposed infant feeding resulting in many changes and inconsistent messages without full consideration of local data. [4,7-8] This resulted in HIV-infected women received conflicting, confusing and suboptimal infant feeding advice, support and counselling from healthcare providers and other influential role players in infant feeding. [9-10] Initially, all women were advised to EBF until new data on vertical transmission led to HIV-infected women being advised to choose either EBF or exclusive formula feeding (EFF) in 2009. This was despite the Western Cape reporting a far higher proportion of infants being formula fed than the national average, women choosing to EFF in less than ideal circumstances and the high cost of free formula provision. [7-8] In 2011, South Africa's infant feeding policy once again recommended EBF for all infants, regardless of a women's HIV status. [11] The provision of free infant formula from public health facilities since 2002 as part of the prevention of mother-to-child-transmission (PMTCT) strategy was stopped. [8] The infant feeding guidelines have been updated since. [4,12] The updated 2018 Western Cape consolidated guidelines recommend EBF for six months and thereafter BF until 24 months. [12]

SA has very high BF initiation rates (75-97%) but has one of the lowest EBF rates in the world. Although BF is a cultural norm in SA, FF is normative along with the early introduction of mixed and supplementary feeds. [2,4,11,13] The avoidance, delayed initiation of BF, the practicing of FF and MF all increase the risk of infant morbidity and mortality as well as decreasing the volume of breastmilk consumed by infants. [8,14-15] EBF is important as the infant mortality rate in SA was estimated at nearly 40% in 2011 and 32,8% in 2017. [8] Factors identified to significantly increase the risk of avoidance or the early cessation of EBF are fear of transmission, larger household size, home births and perceived small birth size. [15-16] Poverty, HIV stigma, disclosure, previous infant feeding experiences, cultural norms around BF, advice from others, insufficient milk syndrome, the desire to prevent vertical transmission, infant illness and lack of self-efficacy have been identified as challenges HIV-infected women face in adopting and practicing EBF, especially in low resource settings. [2,8,11,15,17-23] In SA, more HIV-infected women were found to be intending to EFF and to have maintained EFF than EBF. [18] Women's infant feeding practices were influenced by their return to work or studies, their health status or their perceptions that their breast milk (BM) was insufficient to adequately feed their infant. [11] Previous research showed that BF intention or practice was significantly linked to the presence of running water within the home, residing in formal housing and to have received prenatal infant feeding advice which advocated BF. [10] In the Western Cape in 2009, low rates of EBF were found to be due to cultural practices, governmental support of formula milk (FM), the provision of free FM and lack of EBF promotion due to high HIV prevalence. [8]

There is limited literature which links how HIV-infected women's prenatal feeding intentions are met or not met postpartum especially in relation to the newly adopted World Health Organisation's (WHO) EBF recommendations. [12,18,24-30] True BF practice may be inflated as some studies report the cumulative EBF rate or

92 “prevalence” indicator which is the percentage of infants less than months who are
93 breastfed at some point in time. [11] Self-reporting of EBF is complicated by the
94 incorrect understanding of the definition and potentially poor recall. [21] Many HIV-
95 infected women practice MF believing that they are practicing EBF. [20] Identifying
96 the true number of women who are EBF and EFF after the cessation of the provision
97 of free formula is important. It may assist in the development of better tools to obtain
98 data from HIV-infected pregnant women, impact the content of infant feeding
99 counselling and the way in which it is delivered. Identifying the women who are more
100 vulnerable to MF or FF practice may allow for more focused intervention and support
101 to be provided. This study successfully compares infant feeding intentions with actual
102 practices, and the potentially modifiable factors associated with congruence between
103 infant feeding intentions and practices of HIV-infected women on ARVs.
104

105 # 2. Methods

106 This prospective cohort study used secondary data from the Maternal and Child
107 Health-Antiretroviral Therapy (MCH-ART) study, an implementation science project
108 conducted between 2013 and 2016. The MCH-ART study methodology has already
109 been reported elsewhere [31]. This article includes analysis of in-depth interviews
110 investigating BF practices in the context of maternal ART use, carried out during
111 Phase 2 of the MCH-ART study. Phase 2 of the three interrelated phases of the
112 MCH-ART study was an observational cohort consisting of three study measurement
113 visits; the second prenatal clinic visit, one late trimester prenatal visit and one visit
114 within seven days postpartum. All women were encouraged to exclusively BF for six
115 months. BF counselling was provided from prenatal care initiation to the last prenatal
116 visit.
117

2.1 Study setting

The study was conducted at the Gugulethu Community Health Centre (CHC) in the Nyanga health district of the Cape Town metro region, SA. Prenatal, delivery and postnatal services are offered at the Midwife Obstetrics Unit (MOU) and PMTCT services have been offered since 2010. Approximately 4 900 women from Gugulethu, Philippi, Nyanga, Heideveld, Lower Crossroads areas and the Eastern Cape sought care there during 2010. In 2011, prenatal seroprevalence was greater than 25% and polymerase chain reaction (PCR) results at six weeks estimated the mother-to-child transmission (MTCT) rate at 2% to 4% during the study period [32-33]. The South African National Department of Health was no longer providing free FM to the PMTCT programme. As of August 2011, EBF was promoted as the national infant feeding strategy.

2.2 Study participants and sampling

Phase 1 women were approached by study staff at their second prenatal clinic visit to participate in Phase 2. Participating Phase 1 women were eligible to be enlisted into Phase 2 if they were documented as ART eligible, had commenced ART or zidovudine (AZT) for PMTCT or were scheduled to commence ART at the Gugulethu MOU during their current pregnancy. Those previously using lifelong ART must have been ART free for at least six months. Participants needed to be able to provide informed consent for Phase 2. Women would be excluded if they were not pregnant at the time of recruitment, were intending to relocate out of Cape Town permanently during the study period or if they were unable to consent to, or participate, in the study. This included refusal to take ART or ARVs or if they were in denial of their HIV-infected status. The target sample for the MCH-ART study was a maximum of 600 participants for Phase 2. A total of 584 predominantly Xhosa speaking HIV-

infected pregnant women were enrolled into Phase 2 prenatally. Sample size calculations were determined by the parent study, ensuring sufficient enrolment into Phase 3.

2.3 Data collection

Study staff were trained on the use of the questionnaires prior to data collection. Interviews were conducted in either English or isiXhosa, which are the languages most widely spoken in the study setting. Quantitative, structured questionnaires containing closed and open-ended questions were used to collect data for this secondary analysis. Phase 1, visit one, collected demographic and socioeconomic data, HIV testing history, disclosure and previous ARV status. Phase 2, prenatal visit three took place at approximately 32 to 36 weeks gestation. Visit four usually took place at two to four days postpartum but definitely within seven days postpartum. Phase 2 collected data on previous infant feeding practices, expected infant feeding intentions (visit three), initiation of breastfeeding, infant feeding recalls, formula feeding and separation from their infant (visit four). Data was collected between March 2013 to April 2014 (Phase 1 demographic data from enrolment) and July 2013 to December 2014 (Phase 2) [31].

2.4 Measures

Outcomes for this analysis were EBF intention and EBF status within one week postpartum, conditional on intention. Independent variables and potential confounders that may affect infant feeding intentions and practices contained in the data were identified based on published literature. [2,15,19,29,34] Education, parity, age of mother at birth and mode of delivery were identified as confounders in the literature. Variables identified in the literature as associated with EBF, hence may

influence congruence were relationship status, influential people residing within the household, fear of transmission, cultural norms of introduction of complementary feeding, knowledge of EBF definition, larger household size, access to running water and formal housing.

EBF was defined as the infant receiving breast milk (BM) only, with the provision of no other oral substances, except for drops or syrup consisting of prescribed vitamins, mineral supplements or medicines. EFF was defined as the infant receiving FM only, with the provision of no other oral substances except for drops or syrup consisting of prescribed vitamins, mineral supplements or medicines. MF was defined as the infant receiving either BM and formula, BM and any other liquids or solids including or excluding FM. Or MF was defined as the infant receiving FM and any other liquids or solids including or excluding BM. EFF and MF were merged to avoid a type one error as the MF group contained a very small number of participants. To measure the outcomes, exposure variables were generated based on the stratification of participants by their prenatal infant feeding intentions and postpartum feeding practices. A binary variable was generated that divided women into those who intended to EBF their expected infant and those who did not intend to EBF. This stratification was based on what women answered during their late trimester visit to the question, “How do you plan to feed your baby in the first month after birth?” Responses were coded as intending to EBF or not intending to EBF. Postnatal feeding practices were described by the binary variable dividing women into those who did EBF and those that did not. This composite variable contained answers to the questions, “Have you ever given BM to your baby, within the first three days after birth, was your baby given anything to drink other than BM, are you currently BF your baby, is the mother FF and how old was your baby when you first gave him/her anything other than BM or medicine to drink?” Additional analysis compared women based on their prenatal infant feeding intentions and actual infant feeding practices

198 postpartum. Answers from the late prenatal interview were compared to those given
199 during the postpartum interview. Congruence was indicated if a women's prenatal
200 feeding intentions were practiced postpartum as intended.
201

202 2.5 Data analysis

203 Anonymised data were exported to Stata Version 14.0 (Stata Corporation, College
204 Station, Texas) for analysis. For the EBF intention outcome, descriptive statistics
205 were used to summarise baseline characteristics of the study population stratified by
206 infant feeding intentions and practices. Bivariate associations were calculated using
207 chi-squared and Fishers exact tests if numbers were small for categorical variables.
208 Wilcoxon rank sum tests were used for independent samples of continuous variables.
209 Statistical tests were two-sided at $\alpha = 0.05$. Continuous variables were analysed
210 using medians and interquartile ranges (IQR) or means (n) and percentages (%). A P
211 value (P) of less than 0.05 was considered significant. Additional analysis based on
212 the phase one demographic characteristics, the late third trimester and postpartum
213 visits compared differences in expected EBF, infant feeding practices and
214 congruence based on t tests and χ^2 tests to compare proportion and significance. For
215 the congruence outcome, *a priori* factors associated with congruence of infant
216 feeding intentions and practices were examined using regression with congruence as
217 the dependent variable. Independent variables for inclusion in the analysis were
218 selected based on previous literature and the analysis of empiric confounding.
219 Directed acyclical graphs, univariate analysis of independent variables using a $P <$
220 0.25 and Mantel-Haenszel estimates were used to identify confounders to be
221 included in the model.
222
223 A full model containing all the explanatory variables was fitted. Multivariate log-
224 binomial regression with progressive backward elimination was used to identify

significantly associated characteristics. The criteria for inclusion in the significance model in prior univariate analysis and during backwards elimination was set at a $P < 0.25$. The following independent variables were analysed in the final multivariate model: current employment status, if the current pregnancy was intended, if HIV-infected status was disclosed to anyone and if the women had been previously pregnant. Adjusted relative risk (aRR) and 95% CI were calculated. Standard model checking was carried out including goodness-of-fit testing, identification of any outliers, influential observations, and testing to ensure that the link function was correctly specified.

2.6 Ethics statement

The MCH-ART study received approval by the University of Cape Town Faculty of Health Sciences Human Research Ethics Committee (UCT-HREC) as well as the Institutional Review Board of Columbia University Medical Centre. Ethical approval for extraction and analysis of data for this study collected between March 2013 and December 2014, including the informed consent process, was provided by the UCT-HREC (UCT-REC 213/2017). Participants interviewed were given R80 in grocery vouchers and R20 to compensate for transport costs incurred.

3. Results

The flow of participants in the study is shown in Fig 1. After recruitment of 584 HIV-infected women into Phase 2, 572 participants were included in the final analysis.

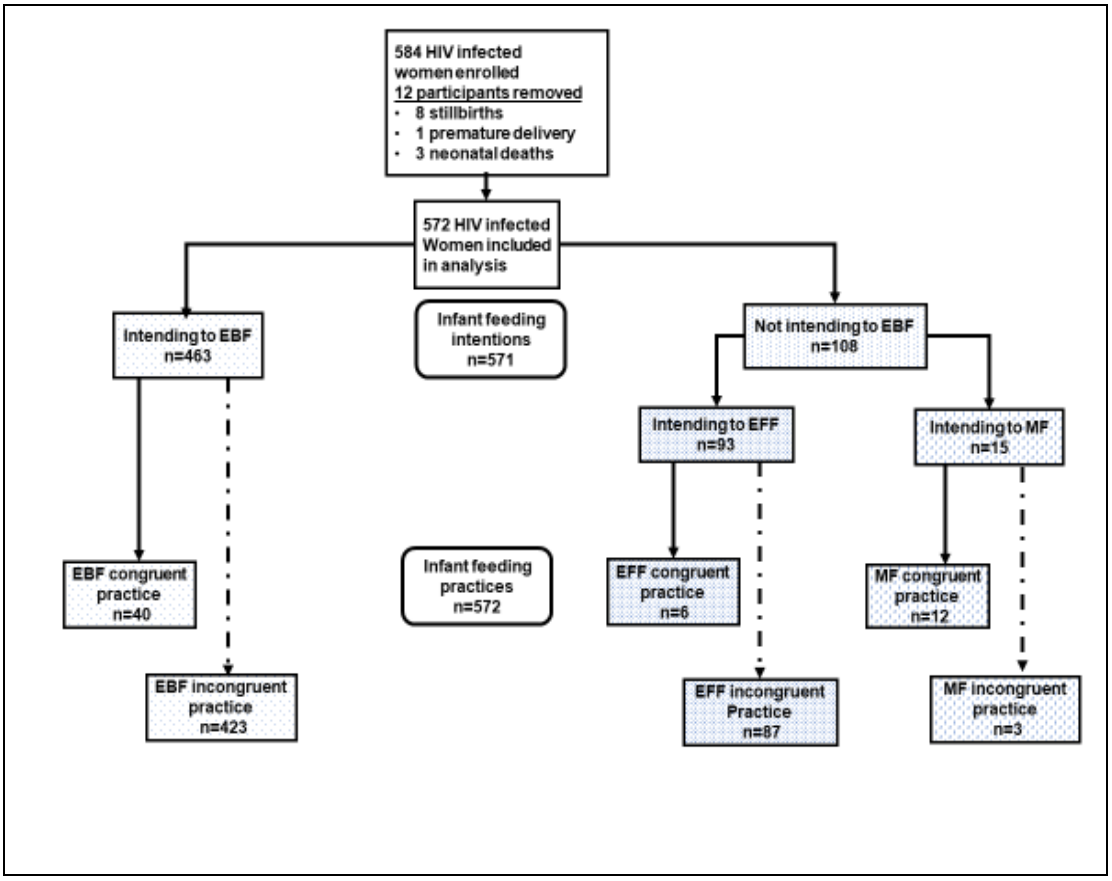

Fig 1. Flow diagram of HIV-infected women intending to EBF, EFF or MF showing subsequent practice and congruence of their infant feeding intentions at or before seven days postpartum. EBF: exclusive breastfeeding. EFF: exclusive formula feeding. MF: mixed feed. Infant feeding intention results were adjusted to account for missing intention data for one participant.

The median age was 28 years (IQR: 24 to 32), 555 (97%) were Xhosa speaking, 548 (96%) had secondary or tertiary education and 355 (62%) were unemployed. If employed (38%), employment tended to be full time (61%). Three hundred and fifty-five women (55%) lived in shacks and informal housing such as hostels and houses built with slabs and 341 (60%) did not have running water within their homes. Cohabiting with three (IQR: 2-4) adults and one (IQR: 0-1) biological child was the norm. Most (82%, n = 471) were multigravid, 96% (n = 548) reported no history of

ART use and 310 (54%) had been diagnosed during their current pregnancy. Almost all (97%, n = 555) were in a relationship but 402 (70%) had not intended their current pregnancy. Three hundred and fifty-nine women (65%) disclosed to their partner and 285 (50%) had disclosed to anyone else.

3.1 Baseline characteristic by infant feeding intentions

Table 1 shows the relationship of baseline characteristics of the HIV-infected women and their prenatal infant feeding intentions. There were no significant differences in demographic, obstetric characteristics and HIV history between these two groups. The only significant finding was women who intended to EBF were significantly more likely to be PMTCT naive (P = 0.010) than women who did not intend to EBF.

Table 1. Characteristics of 572 participants collected from enrolment into Phase 1 stratified by exclusive breastfeeding (EBF) intention measured at the Phase 2 prenatal visit three at approximately 32 to 36 weeks gestation.

	Intending to EBF	Not intending to EBF	Total	
	n (%) or median (IQR)	n (%) or median (IQR)	n (%) or median (IQR)	P value*
Number of women	463 (81)	108 (19)	572 (100) †	-
Total months of observation	444 (18)	2039 (82)	2484 (100) §	-
Demographics				
Age	28 (24-32)	29 (25-32)	28 (24-32)	0.083
Language				
Xhosa	451 (97)	104 (96)	555 (97)	0.519
Other	12 (3)	4 (4)	16 (3)	
Education				
Primary	21 (5)	2 (2)	23 (4)	0.280
Secondary / Tertiary	442 (95)	106 (98)	548 (96)	
Employed				
Yes	171 (37)	45 (42)	216 (38)	0.379
No	292 (63)	63 (58)	355 (62)	
Employment Type				
Full time	106 (62)	26 (58)	132 (61)	0.606
Part time	65 (38)	19 (42)	84 (39)	
Housing				
House, flat, council flat	213 (46)	45 (41)	258 (45)	0.415
Shack & other	250 (54)	63 (58)	313 (55)	
Present within home				
Toilet				
Yes	129 (28)	28 (26)	414 (73)	0.685
No	334 (72)	80 (74)	157 (28)	
Running water				
Yes	189 (41)	41 (38)	230 (40)	0.586
No	274 (59)	67 (62)	341 (60)	
Electricity				
Yes	105 (97)	454 (98)	559 (98)	0.707
No	3 (3)	9 (2)	12 (2)	
Refrigerator				
Yes	378 (82)	87 (81)	465 (81)	0.794
No	85 (18)	21 (19)	106 (19)	
Landline Phone				
Yes	10 (2)	0 (0)	10 (2)	0.221
No	453 (97)	108 (100)	561 (98)	
Television				
Yes	429 (93)	101 (94)	530 (93)	1.000
No	34 (7)	7 (6)	41 (7)	
Total number of people living in home	4 (3-6)	4 (2-5)	4 (3-6)	0.193
Adults, 16 years and older	3 (2-4)	2 (2-3)	3 (2-4)	0.078
Children, 15 years and younger	1 (0-2)	1 (0-2)	1 (0-2)	0.512
Obstetric characteristics				
Current pregnancy intended				
Yes	136 (29)	33 (31)	169 (27)	0.809
No	327 (71)	75 (69)	402 (70)	
Gravidity				
1	82 (18)	18 (17)	100 (18)	0.797
≥1	381 (82)	90 (83)	471 (82)	
HIV history				

Children living	1 (1-2)	2 (1-2)	1 (1-2)	0.340
Children residing with mother	1 (0-1)	1 (0-2)	1 (0-1)	0.827
Children tested HIV+				
Yes	6 (2)	4 (4)	10 (2)	0.107
No	370 (98)	86 (96)	456 (98)	
Currently in a relationship				
Yes	452 (98)	103 (95)	555 (97)	0.201
No	11 (2)	5 (5)	16 (3)	
Disclosed status to partner				
Yes	154 (34)	42 (41)	196 (35)	0.199
No	298 (66)	61 (59)	359 (65)	
Disclosed status to anyone				
Yes	224 (48)	62 (57)	286 (50)	0.091
No	239 (52)	46 (43)	285 (50)	
Diagnosed				
In this pregnancy	53 (49)	257 (56)	310 (54)	0.227
Before this pregnancy	55 (51)	206 (44)	261 (46)	
ARV use[§§]				
Previous PMTCT				
Yes	118 (31)	41 (46)	159 (34)	**0.010**
No	260 (69)	49 (54)	309 (66)	
Previous ART				
Yes	17 (4)	6 (6)	23 (4)	0.370
No	446 (96)	102 (94)	548 (96)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

† Missing response for 1 participant, n = 572.

§ Difference in total due to missing response for 1 participant accounting for 6 months.

§§ Previous PMTCT: prophylaxis, not lifelong ART. Previous ART: lifelong triple drug antiretroviral therapy

3.2 Previous infant feeding experience and current intentions

At 32 to 36 weeks gestation, 463 (81%) women expressed intentions to EBF (Fig 1). Of the 108 (19%) women who did not intend to EBF, 93 (16%) were intending to EFF and 15 (3%) were intending to MF. Previous infant feeding experience, and intentions for their expected infant, are stratified by EBF intention in Table 2. Eighty percent (n = 455) of the women provided responses pertaining to previous infant feeding experiences. Previous BF was common in both groups (78%, n = 346). The proportion of women who had breastfed previous infants was significantly higher among women intending to EBF compared to those who did not intend to EBF (P = 0.009). Women who intended to EBF also tended to have breastfed previous infants

for longer than six months (74%, n = 211, P = 0.057), as well as being more likely to have EBF for at least six months (65%, n = 234, P = 0.099) although these results were not significant.

Table 2. Previous infant feeding experience stratified by exclusive breastfeeding (EBF) intention at the late 3rd trimester interview at approximately 32 to 36 weeks gestation.

	Intending to EBF n (%) or median (IQR)	**Not intending to EBF** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P value*
Previous infant feeding experience				
Previous children				
Yes	362 (78)	82 (76)	444 (78)	0.611
No	101 (22)	26 (24)	127 (22)	
Breastfed previous infant(s)				
Yes	291 (80)	55 (67)	346 (78)	**0.009**
No	71 (20)	27 (33)	98 (22)	
Duration of previous breastfeeding				
<6 months	75 (26)	20 (39)	95 (28)	0.057
≥6 months	211 (74)	31 (61)	242 (72)	
Age at introduction of water or liquids				
<6 months	182 (50)	47 (57)	229 (52)	0.249
≥6 months	180 (50)	35 (43)	215 (48)	
Age at introduction of animal milk or solids				
<6 months	151 (42)	40 (49)	191 (43)	0.243
≥6 months	211 (58)	42 (51)	253 (57)	
Age of last child when anything other than breast milk was introduced				
<6 months	128 (35)	37 (45)	165 (37)	0.099
≥6 months	234 (65)	45 (55)	279 (63)	
Expected infant feeding intentions				
Duration intending to breastfeed				
<6 months	63 (15)	6 (16)	69 (15)	0.779
≥6 months	371 (85)	31 (84)	402 (85)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

3.3 Postpartum infant feeding practices

In sub-analysis, when the demographic, clinical and obstetric characteristics were stratified by postpartum infant feeding practices (S1 and S2 Table) disclosure became significant. The proportion of women who had not disclosed to anyone else was significantly greater in the group who had who practiced EBF or had breastfed at any stage postpartum than those who had not practiced EBF or had not BF at any stage (S1 Table, P = 0.049; S2 Table, P = 0.012). The proportion of women who had

not disclosed to their partner was significantly higher in women who had practiced EBF than those who had not (S2 Table, P = 0.043). Previous infant feeding experience, and feeding intentions for the expected infant, were stratified by EBF and BF practice in S3 – S4 Tables. S4 Table shows that the proportion of women who had previously BF an infant (P = 0.001) and were intending to EBF (P < 0.001) was significantly greater in those who had ever practiced BF postpartum compared to those who had never practice EBF postpartum.

3.4 Congruence of infant feeding practices

When congruence was stratified by demographic, clinical and obstetric characteristics in sub analysis (S5 Table), a significantly greater proportion of women who had practiced congruent infant feeding were more likely to have not disclosed their HIV-infected status to their partners (P = 0.035) or anyone else (P = 0.049). The proportion of those intending to EBF their expected infant was significantly higher in those who were incongruent (P = 0.013) than those who were congruent when previous infant feeding experience and feeding intentions for the expected infant were stratified by congruence (S6 Table).

Table 3 shows data on BF initiation and infant feeding recalls stratified by congruence. Overall, 523 (91%) of the women had initiated BF. By seven days postpartum significantly more women who were incongruent in their infant feeding practices had initiated BF postpartum (P = 0.046) and had administered medication to their infants (P = 0.001). A significantly higher proportion of women who practiced congruent infant feeding had fed their infant formula or cows' milk (P = 0.001). When separated from their mothers due to work, education or being sent away to be cared for elsewhere, all the infants in the congruent group were fed with FM. In the

incongruent group, significantly more infants were fed with BM, water or a milk-based liquid than in the congruent group (P = 0.049).

Table 3. First postpartum visit at or before seven days postpartum stratified by congruence of infant feeding intentions and practices by HIV-infected women.

	Congruent to feeding intentions n (%) or median (IQR)	**Incongruent to feeding intentions** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P value*
Initiation of breastfeeding				
Ever given breastmilk to infant				
Yes	49 (84)	474 (92)	523 (91)	**0.046**
No	9 (16)	40 (8)	49 (9)	
Time of postnatal breastfeeding initiation				
Within 1st hour	39 (80)	419 (89)	458 (88)	0.068
After 1st hour	10 (20)	54 (11)	64 (12)	
1st milk breastfed to infant or expressed and discarded				
Breastfed to infant	13 (33)	82 (27)	95 (28)	0.440
Expressed and discarded	26 (67)	217 (73)	243 (72)	
In 1st 3 days, infant given any other liquids besides breastmilk				
No	21 (46)	208 (52)	229 (51)	0.405
Yes	25 (54)	191 (48)	216 (49)	
If yes, infant was given				
Water or water with sugar	0 (0)	1 (0)	1 (0)	0.373
Infant formula	1 (8)	9 (3)	10 (7)	
Medicine – prescription / non-prescription	12 (92)	295 (97)	307 (97)	
In 1st 3 days, infant fed anything besides breastmilk				
No	21 (46)	208 (52)	229 (51)	0.405
Yes	25 (54)	191 (48)	216 (49)	
If yes, infant was fed				
Water or water with sugar	0 (0)	5 (1)	5 (1)	**0.001**
Infant formula or cow's milk	2 (13)	5 (1)	7 (2)	
Medicine – prescription / non-prescription	13 (87)	412 (98)	425 (97)	
Infant feeding recalls				
Breastfeeding women				
Currently breastfeeding infant				
Yes	48 (83)	422 (86)	490 (86)	0.505
No	10 (17)	72 (14)	82 (14)	
Duration of breastfeeding				
≤ 7 days	10 (100)	65 (90)	75 (91)	0.303
>7 days	0 (0)	7 (10)	7 (9)	
Reasons for breastfeeding cessation				
Separation from infant†	0 (0)	22 (32)	22 (28)	0.051
Physiological issues§	4 (44)	31 (45)	38 (46)	
Fear of HIV transmission or pressure§§	5 (56)	16 (23)	21 (26)	
Formula feeding women				
Currently formula feeding				
Yes	6 (10)	53 (10)	59 (10)	0.994
No	52 (90)	461 (90)	513 (90)	
Receiving formula from hospital / clinic				
Yes	3 (50)	20 (38)	23 (39)	0.559
No	3 (50)	33 (62)	36 (61)	
Have there been clinic shortages				
Yes	0 (0)	1 (5)	1 (4)	0.664
No	4 (100)	21 (95)	25 (96)	
Has formula been purchased				
Yes	4 (67)	38 (72)	42 (71)	0.796

No	2 (33)	15 (28)	17 (29)	
Has women run out of formula				
Yes	0 (0)	1 (2)	1 (2)	0.734
No	6 (100)	52 (98)	58 (98)	
Ever breastfed infant for any reason				
Yes	0 (0)	16 (30)	16 (27)	0.115
No	6 (100)	37 (70)	43 (73)	
Have you seen formula adverts in clinics				
Yes	0 (0)	11 (21)	11 (19)	0.216
No	6 (100)	42 (79)	48 (81)	
Separated from infant				
Did a carer feed the infant when separated from mother				
Yes	2 (3)	26 (5)	28 (5)	0.590
No	56 (97)	488 (95)	544 (95)	
What was the infant fed by carer				
Breastmilk, water or milk-based liquids	0 (0)	18 (69)	18 (64)	**0.049**
Formula	2 (100)	8 (31)	10 (36)	

* Bivariate and multivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

† Separation from infant: work, education, infant sent away

§ Physiological reasons: illness, lactation issues, failure to thrive

§§ Fear of HIV transmission or pressure: advice from health care practitioners, pressure from family, non-disclosure and fear of status being revealed, HIV viral load too high

At one week postpartum, 40 of the 463 HIV-infected women who intended to EBF were practicing EBF therefore 7% practiced congruent infant feeding (Fig 1). Of those not intending to EBF, 18 (17%) did not practice EBF and were therefore congruent. When divided into those who intended to EFF or MF, of the 93 women intending to EFF, six practiced EFF and therefore 6% practiced congruent infant feeding. Fifteen (14%) HIV-infected women intended to MF but 12 practiced MF, therefore 80% practiced congruent infant feeding. Detailed reasons for BF and FF women not feeding their infants as intended can be found in Fig 2.

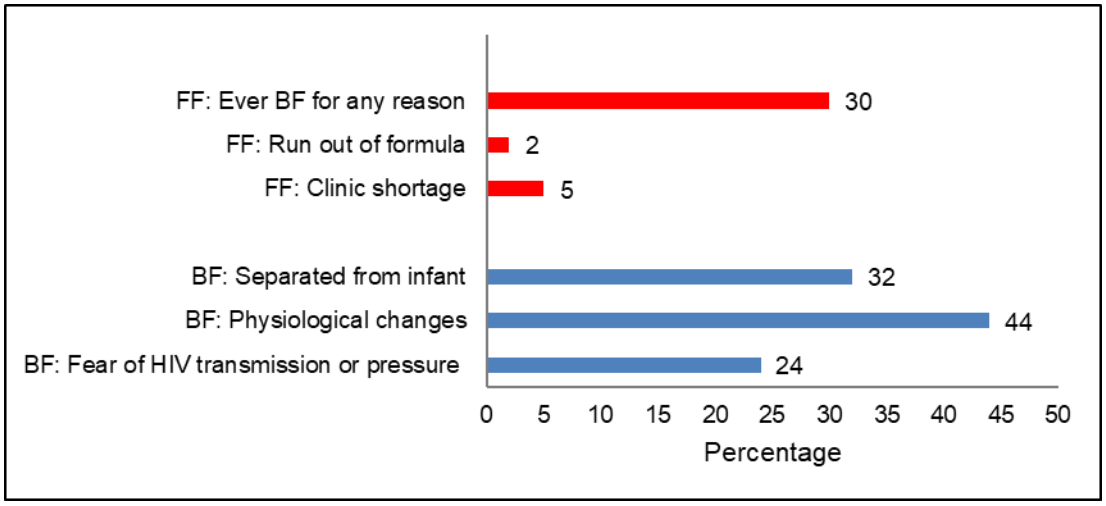

Fig 2. Reasons given by HIV-infected mothers for not feeding their infant as intended at or before seven days postpartum. FF: Formula feeding. Women reported not EFF due to unavoidable BF, running out of formula and clinic shortages of free formula. BF: Breastfeeding. Women reported not EBF due to separation from infant due to work, attending school or tertiary studies or their infant was sent elsewhere. Physiological changes such illness, lactation issues and infant's failure to thrive were the most prevalent reasons. Other reasons were fear of HIV transmission, high HIV viral load, advice from healthcare workers, pressure from family members and a fear of their HIV-infected status being revealed.

A sub-analysis summarises all infant feeding related to BF, which includes intention, practices and congruence (S1 Fig and S7 Table). Nine percent (n = 40) of women intending to EBF practiced congruent EBF. EBF practice accounted for 69% (n = 40/58) of those who practiced congruent infant feeding. Six women who said that they were intending to EFF and 12 who said they were intending to MF practiced congruent infant feeding by meeting their feeding intentions postpartum (S8 Table). There was no association between intention to EBF and actually EBF (P = 0.898), nor between intending to MF and actually MF (P = 0.194). Only intending to EFF was significantly associated with practicing EFF (P = 0.002). Most women intended to

EBF, however 90% practiced MF (S2 Fig). The percentage of congruence was very low. Seven percent of those intending to EBF did so postpartum. Almost none of those who intended to EFF or MF did so. The overall prevalence of congruence was 10% as 58 of the 572 women practiced how they intended to prenatally.

3.5 Characteristics associated with congruence

Table 4 summarises the crude and adjusted log-binomial regression models that evaluated prenatal characteristics associated with infant feeding congruence. For crude associations with congruence, no significant associations were found with the demographic, obstetric and HIV history characteristics. In the adjusted model, for congruence in HIV-infected women's infant feeding intentions and practices, no significant associations were found with the prenatal characteristics of part time or full-time employment, intending the current pregnancy and gravidity status. The only prenatal characteristic associated with congruence was disclosure. Those who had disclosed their status to anyone had 0.56 times the risk of congruence during the study compared to those who didn't disclose. This equates to a 44% reduced risk of congruence.

Table 4. Factors associated with congruence of infant feeding intentions and practices in HIV-infected women.

	Crude associations			Adjusted associations†		
	RR	95% CI	P-value	aRR	95% CI	P value
Age						
<30years (ref)	1.00		0.427			
30 years and older	0.81	0.48, 1.36				
Education						
Primary (ref)	1.00		0.377			
Secondary / Tertiary	2.39	0.35, 16.49				
Employed						
Yes	0.68	0.40, 1.17		0.68	0.40, 1.17	
No (ref)	1.00		0.167	1.00		0.161
Housing						
House, flat, council flat	1.00		0.726			
Shack & other	1.09	0.67, 1.79				
Running water within home						
Yes	0.97	0.60, 1.60				
No (ref)	1.00		0.905			
Total number of people living in home	0.98	0.89, 1.08	0.689			
Current pregnancy intended						
Yes	0.69	0.38, 1.24		0.69	0.38, 1.25	
No (ref)	1.00		0.216	1.00		0.222
Currently in a relationship						
Yes	1.64	0.24, 11.12				
No (ref)	1.00		0.612			
Diagnosed						
In this pregnancy (ref)	1.00		0.477			
Before this pregnancy	0.84	0.51, 1.37				
Disclosed status to anyone						
Yes	0.61	0.37, 1.00		0.56	0.34, 0.93	
No (ref)	1.00		0.052	1.00		**0.025**
Previously pregnancy						
Yes	1.37	0.67, 2.08		1.52	0.74, 3.13	
No (ref)	1.00		0.385	1.00		0.255

RR, risk ratio; aRR, adjusted risk ratio.

†Adjusted model includes employed, current pregancy intended, disclosed status to anyone and previously pregnant.

Adjusted log-binomial regression models (Table 5) showed that during the course of the study, 423 women who did not meet their prenatal EBF intentions by practicing either EFF or MF had a 84% significantly reduced risk of incongruent infant feeding if they had secondary or tertiary education compared to those who did not have secondary or tertiary education (aRR 0.84; CI: 0.71, 0.99). For the 87 women who intended to EFF but practiced incongruent EBF or MF, disclosure to anyone resulted in a 55% significantly increased risk of practicing incongruent infant feeding compared to those who did not disclose (aRR 1.55; CI: 1.04, 2.31).

Table 5. Regression on factors associated with incongruent infant feeding among HIV-infected women for those who moved from (i) exclusive breastfeeding (EBF) intent to formula feeding or mixed feeding (n = 423) and (ii) exclusive formula feeding (EFF) intent to exclusive breastfeeding or mixed feeding (n = 87).

	(i) Adjusted associations incongruent EBF*			(ii) Adjusted associations incongruent EFF†		
	aRR	95% CI	P-value	aRR	95% CI	P value
Education						
Primary (ref)	1.00		**0.046**	**-**	**-**	**-**
Secondary / Tertiary	0.84	0.71, 0.99				
Disclosed status to anyone						
Yes	-	-	-	1.55	1.04, 2.31	
No (ref)				1.00		**0.032**

aRR, adjusted risk ratio.

*Crude associations (RR) calculated for factors included in full model due to α<0.25; incongruent (outcome), education status, total number of people living in home. Adjusted associations (aRR) calculated using backwards elimination log-binomial regression. Final model included education (n = 423).

†Crude associations (RR) calculated for factors included in full model due to α<0.25; incongruence (outcome), employed, dislosed status to anyone, age, total number of people living in home, currenly in a relationship, diagnosed in this pregnancy. Adjusted associations (aRR) calculated using backwards elimination log-binomial regression. Final model included disclosure (n = 87).

4. Discussion

This study provides information on infant feeding intentions, practices and subsequent congruence between intentions and practices in HIV-infected women. Most women in this study intended to EBF. Adherence to EBF was low and by seven days postpartum most women were MF, despite their prenatal infant feeding intentions. The prevalence of congruence between infant feeding intentions and practices was low. These results suggest gaps in the delivery of prenatal counselling and support services provided to HIV-infected women and may have ramifications for the risk of vertical transmission. EBF decreases the risk of infant mortality and morbidity despite the presence of adverse conditions to infant survival and its protective benefit increases as the duration of EBF increases. [14,17]

436

437 At baseline, the proportion of women who were PMTCT naive and who had BF an
438 infant previously was greater in women intending to EBF than in those who were not
439 intending to EBF. Consistent EBF messages from trained healthcare workers who
440 supported EBF themselves may have made a greater impact on PMTCT naive
441 women, making them more receptive to the message of EBF. [17-18,35-38] Intention
442 to EBF was greater in women who had previously BF infants than those who had not
443 and most reported having continued BF for longer than six months. These findings
444 are supported by Bentley *et al.* [39], Phillips *et al.* [40] and Sutherland *et al.* [41] who
445 found that infant feeding intentions and practices were strongly recurrent for
446 subsequent births and more so when pertaining to EBF.

447

448 Similar to previous research findings, BF initiation was high in this study and the
449 majority of women initiated BF within the first hour of birth as per the WHO
450 recommendations and South African BFHI policy. [42] But as in other studies, this did
451 not lead to congruence. Lack of disclosure in this study resulted in some women
452 initiating BF for less than seven days because family members or hospital staff
453 following BFHI policy expected them to. [30] Avoiding initiation of BF and choosing to
454 EFF may have revealed their HIV-infected status. [11] A larger proportion of women
455 initiated BF in the incongruent group than in the congruent group. By initiating BF
456 within one to 24 hours postpartum due to pressure from others, women who intended
457 to EFF were immediately categorised as MF. This was regardless of whether they
458 continued with EFF after discharge from a healthcare facility or when no longer
459 pressurised to do so by family members.

460

461 Only 10% of postpartum women reported meeting their prenatal infant feeding
462 intentions. The low levels of congruence found in this study is in keeping with findings
463 of studies in SA by Siziba *et al.* [11] and Zulliger *et al.* [10]. However, this study's

findings were not consistent with previous studies in SA, Nigeria, Zambia and Kenya where higher prevalence of congruence was reported. [18,22,27,43-44] The higher numbers of women reported as meeting their infant feeding intentions postnatally in these studies may be due to several factors which differed from this study. Different infant feeding policies may have led to infant formula being readily available to those who intended to and practiced EFF whereas free infant formula was not readily available to women in this study. [18,43,45]. Different cultural norms around infant feeding where EBF intention and practice is the norm, may have led to increased congruence. [27,38] Low congruence in this study reflect the low EBF rates as is the cultural norm in the Western Cape. [8] Some studies took place in rural setting as opposed to the peri-urban setting of this study. Rural women may have less access to education, employment and the financial means to obtain infant formula leading to higher EBF intention and practices in rural settings. [10,22,27,46]

In this study data suggests that women who disclosed their HIV status had a reduced risk of congruence. These data were the same as other studies where non-disclosure resulted in more MF. [26-27,47] However, this is an interesting result in that choosing to EFF feed in other studies equated to women announcing their HIV-infected status. [26-27] This study's results indicated that many women were choosing to hide their HIV infected status from partners and others, leading to adaptations to infant feeding practices so that their status remains hidden. [17,26-27,48] Reasons for not disclosing could include the recent timing of their prenatal diagnosis within the previous month. [46] Women may not have had adequate time to deal with the impact of their diagnosis and infant feeding decisions needed to be made within a limited time before delivery. [30,46] Infant feeding decisions and key messages regarding infant feeding such as the dangers of MF may have been eclipsed by their anxiety about transmission to their partner and the consequences of disclosure to their families and communities. [30,46]

The proportion of infants who were fed formula by a carer when separated from their mothers was greater in the congruent infant feeding group compared to the incongruent group. Previous research has shown that when separated from their infants, mothers often find that infants are fed infant formula by carers who override a women's intention to EBF her infant. [11] This may have contributed to the higher proportion of women in this study who intended to EFF from the outset being more likely to practice congruent infant feeding. These women did not initiate BF at any stage postpartum and regardless of separation, formula was fed to their infant. Reasons given by women for incongruent infant feeding practices in the women who intended to EFF were having BF at some stage, having run out of infant formula and clinic shortages of infant formula leading to lack of access. For those who intended to EBF, separation from their infant due to their return to work, studies or the infant being sent elsewhere, illness, lactation issues, and an infant failing to thrive were the most prevalent reasons for incongruent infant feeding practice. The above findings have been commonly reported in previous literature. [11,13,27,29] Identifying women who will face separation from their infants for short or long durations (being sent away to family in another province) during the prenatal stage for additional infant feeding counselling is important. Providing additional targeted, pragmatic support to these women and their families or prospective infant carers could lead to increased congruence and reduced MF. Although controversial, successful and safe congruence in cases of long-term separation from infants may mean EFF or MF as supported by the most recent guidelines rather than EBF. [12,49-51] Any benefits to BF initiation and therefore MF for this population of women is an area for further research.

Despite participants in this study attending at least three prenatal counselling sessions where they received infant feeding counselling as per WHO guidelines,

congruence was still low. This is contrary to findings by Aishat *et al.* [52] and Adejuyigbe *et al.* [27] who reported that women attending more than three prenatal visits were more likely to practice EBF and attending more than one prenatal visit was associated with congruence respectively. From the analysis carried out in this study, it's not possible to ascertain with certainty whether there is an association between intention to EBF, congruence and the number of prenatal counselling visits attended. However, based on similarities in the abovementioned studies, it can be hypothesised that these associations are present in this study. Further research is required to fully explore the impact of the number of prenatal visits on congruence, especially in women who are diagnosed later in their pregnancies.

Congruence in this study may be lower than other studies results due to how congruence was defined and reported. [22, 27, 38, 44] Congruence was reported for each individual participant by linking the reported intention and practice to their patient identifier number. Participants responses related to infant feeding were then recoded into variables that reflected their infant feeding category based on strict definitions of infant feeding used in this study, which differed from other studies. [18, 38, 44] When the EBF practice variable was coded, it was clear that there was a misunderstanding of the definition of EBF among the women. Two hundred and thirty-three women were categorised as EBF based on their responses to questions regarding initiation of BF and infant feeding recalls. When the variable coded for 'actual EBF' practice was cross checked with responses provided to questions related to formula feeding, only 61% (n = 141/233) of the women in the EBF group responded that they were not currently FF. These data should be interpreted in light of several strengths and limitations. This study was able to account for and report the true EBF prevalence and congruence in this cohort whereas other studies' results may have been impacted by women's misunderstanding of the definition of EBF. Women may have reported having practiced EBF when they perceived they were

548 doing so, but not practicing EBF as per the study definition of EBF. [11, 28] The
549 differing definitions of infant feeding methods use by other studies may be an
550 additional factor accounting for this study's lower results when compared to previous
551 research. Rigorous methodology and strict definition of infant feeding were strengths
552 of this study. [11]
553
554 The longitudinal design enabled the determination of how intentions translate to
555 practice. Most women were interviewed within four days postpartum but definitely by
556 seven days postpartum, resulting in very accurate recall of infant feeding. [21]
557 Women's own reports of infant feeding were used in this study. This is a potential
558 weakness as women may have reported what they thought investigators wanted to
559 hear resulting in self-report bias. The quantitative design did not allow for detailed
560 exploration into motivation of intentions and practices. As this study was conducted in
561 only one community, these findings have limited generalisability only to settings with
562 similar cultural and socioeconomic conditions.
563

564 # 5. Conclusions

565 In conclusion, these data demonstrate that despite most HIV-infected women
566 intending to EBF in the prenatal period, most women practiced MF in the postpartum
567 period and disclosure affected congruence. With the shift to the promotion of EBF for
568 all HIV-infected women in SA, these findings highlight the importance of promoting
569 EBF during the prenatal and postpartum periods for congruence. These data indicate
570 that the model used to advise women about infant feeding even in a study setting
571 was not successful. An HIV-infected women's disclosure status should be asked
572 about and accounted for when advising expectant women about infant feeding. The
573 results indicate that despite previous study findings in similar socioeconomic
574 environments, congruence is difficult to predict.

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Supporting information

S1 Table. Characteristics of HIV-infected women stratified by exclusive breastfeeding (EBF) practice reported at or before seven days postpartum (n=572).

S2 Table. Characteristics of HIV-infected women stratified by breastfeeding status at or before seven days postpartum (n=572).

S3 Table. Previous infant feeding experience of multiparous HIV-infected women and their intentions for the expected infant reported prenatally at the late third trimester interview stratified by exclusive breastfeeding (EBF) practiced during this study reported at or before seven days postpartum.

S4 Table. Previous infant feeding experience of multiparous HIV-infected women and their intentions for the expected infant reported prenatally at the late third trimester interview stratified by their congruence status reported at or before seven days postpartum.

S5 Table. Characteristics of HIV-infected women stratified by congruence of infant feeding intentions and practices at or before seven days postpartum (n=572).

S6 Table. Previous infant feeding experience of multiparous HIV-infected women and their intentions for the expected infant reported prenatally at the late third trimester interview stratified by their breastfeeding practice reported at or before seven days postpartum.

S1 Fig. BF related infant feeding intentions and practices of HIV-infected women in Gugulethu, Western Cape. EBF: exclusive breastfeeding. BF: breastfeeding.

S7 Table. Infant feeding intentions and breastfeeding practices.

S8 Table. Prenatal infant feeding intentions to exclusively breastfeed, exclusively formula feed or mixed feed stratified by actual postpartum infant feeding practices.

S2 Fig. Infant feeding of 572 HIV-infected women in Gugulethu grouped by infant feeding method reflecting the intention, practice and congruence related to each method investigated (n=572). EBF: exclusive breastfeeding. EFF: exclusive formula feeding. MF: mixed feeding. Participants who are reflected as intending and practicing a certain infant feeding method in each feeding method in the figure above and these intentions and practices are not necessarily related to the same individual participants. Overall congruence represents the 58 individual participants who expressed intention to use the same infant feeding method that they practiced.

Part D: Appendices

Appendix A. Phase 2 informed consent used in MCH-ART parent study

Phase 2 Informed Consent Form

TITLE OF RESEARCH: **Strategies to optimize antiretroviral therapy services for maternal & child health: the MCH-ART study**

WHAT IS THE PURPOSE OF THIS STUDY?
We are from the University of Cape Town and ICAP at Columbia University. You are being asked to take part in a study that is being conducted at the Gugulethu Midwife Obstetric Unit (MOU). The purpose of this study is to understand how to improve health care services for HIV-positive women during their pregnancy and after they deliver the baby.

We know that it is important for their own health as well as the health of their baby, that HIV-positive women receive the HIV care and treatment that they need both during and after delivery. Information learned in this study will help us to improve HIV services for pregnant women.

You are being asked to take part in this study because you are a pregnant woman with known HIV infection who is about to start taking HIV drugs (antiretroviral therapy) and you took part in the first phase of the study. The purpose of this consent form is to give you information to help you decide if you want to take part in the next phase of this study.

WHAT DO I HAVE TO DO IF I AGREE TO TAKE PART?
If you agree to take part, you will come in for up to 3 visits. These visits will take place today while you are in the clinic, when you are getting close to delivering your baby and within one week of delivering your baby. These study visits are separate from the usual clinic visits that you will have for your pregnancy and HIV care. Study visits will be timed so that they take place on the same days that you come in for your usual pregnancy and/or HIV care.Each visit will take about 30-45 minutes.

At the two visits that are conducted *while you are pregnant,* you will do the following:

- Answer questions about your recent pregnancy- and HIV-related health care, HIV disclosure, and use of HIV drugs (including side effects and adherence).
    - At different visits, we will ask you additional questions about HIV, stigma, social support, infant feeding practices, family planning, experiences of partner violence, and mental health (including drug and alcohol use).
- Have 5mLs (1 teaspoon) of blood drawn from your arm each time

One-week after delivery
One week after you give birth to your baby, you will come to the clinic for a visit that will include the following:

- Answer questions about your recent pregnancy- and HIV-related health care, HIV disclosure, and use of HIV drugs (including side effects and adherence).
    - At this visit, we will ask you additional questions about family planning after delivery, how you felt about the HIV care that you received, infant feeding practices and infant health and health care.
- Have 5mLs (1 teaspoon) of blood drawn from your arm

Appendix B. CRFs used for data collection in MCH-ART parent study

Form 1 page 1. MCH-ART demographics & medical history, Phase 1

MCH-ART: Demographics & Medical History, Phase 1
Xhosa-English of Version 3.0, 15 October2013

PID: 1 - __ __ __ __ - __ __

		Visit Date: __ __/__ __ __/__ __ __ __
1.	Mingaphi iminyaka yakho *What is your age?*	*Age:* _____Iminyaka/*years*
2.	Uloluphi uhlanga *What population group do you belong to?*	UmAfrika African = 1 Indiya *Indian* = 2 Umntu webala *Coloured* = 3 Umlungu *White* = 4 Olunye = 5, cacisa: _____ *Other specify*
3.	Uthetha oluphi ulwimi ekhayai? *What language do you speak at home?*	isiXhosa = 1 isiZulu = 2 isiBhulu *Afrikaans* = 3 isiNgesi *English* = 4 Olunye = 5, cacisa: _____ *Other specify*
4.	Lelephi elona banga liphezulu oliphumeleleyo? *What is the highest level of schooling/education that you have completed?*	Umgangatho/*Grade*:_____ Okanye/*or* Ibanga/ *Standard*:_____ Imfundo enomsila/ *Postsecondary*:_____
5.	Ngoku uyasebenza okanye uyafunda *Are you currently working and /or studying?*	Hayi *No* = 0 → Gqithela ku Q7 **SKIP to Q7** Ewe *Yes* = 1
6.	Ukuba nguEwe, yeyephi kwezi zilandelayo echaza, bhetele ukuba wenza ntoni? *If yes, which of one the following best describes what you do?* Khetha ibenye */Choose one only*	Ndiphangela isigxina = 1 *Employed full-time* Ndiphangela mangqaphangqapha = 2 *Employed part-time* Ndiphangela izingxungxo/ ndingumatheng 'ethengisa = 3 *Informal job/hawker* Uhamba isikolo/ ungumfundi = 4 *Attending school/learner* Uhamba isikolo semfundo enomsila = 5 *Attending tertiary education facility*
7.	Ngowuphi owona mthombo wemali kwikhaya lakho? *What is the MAJOR source of income for your household?* Khetha ibenye */Choose one only*	Ayikho =0 *None* Umsebenzi osisigxina =1 *Full-time employment* Umsebenzi wamaangqaoha-ngqapha =2 *Part-time employment* Umsebenzi wezingxungxo/ umthengisi =3 *Informal employment* Imali yesibonelelo sokukhuba zeka karhulumente= 4 *Disability grant* Imali yesibonelelo karhulumente =5 *Social grant* Umhlala phantsi =6 *Pension* Olunye imali yesibonelelo =7 *Other grant* chaza: _____ *specify type* Olunye =8 *Other* Chaza: _____ *specify* Andazi = 9 *Don't know*

Page **1** of **7**

Initials of counsellor: _____

Form 1 page 2. MCH-ART demographics & medical history, Phase 1

MCH-ART: Demographics & Medical History, Phase 1 PID: 1 - __ __ __ __ - __ __
Xhosa-English of Version 3.0, 15 October2013

8.	Uhlala kwikhaya elinjani? *What kind of home do you live in?*		Ityotyombe/ uhlaliso olungahlelwanga = 1 *Shack/informal dwelling* Indlu yesitena = 2 *Formal house* Ifleti/ indlu kamaspala = 3 *Flat/council home* Enye = 4, chaza:_____ *Other, specify*
9.	Ingaba indlu yakho inazo ezi zinto zilandelayo: *Does your house have the following: Read and answer for all*	a. Indlu yangasese *A toilet inside*	Hayi/*No* =0 Ewe/*Yes* =1
		b. Amanzi abalekayo empompo *Running water inside*	Hayi/*No* =0 Ewe/*Yes* =1
		c. Umbane *Electricity inside*	Hayi/*No* =0 Ewe/*Yes* =1
		d. Isikhenkcisi *A refrigerator*	Hayi/*No* =0 Ewe/*Yes* =1
		e. Umnxeba *A telephone*	Hayi/*No* =0 Ewe/*Yes* =1
		f. Umabona kude *A television*	Hayi/*No* =0 Ewe/*Yes* =1
10.	Bangaphi abantu abahlala kule ndlu bedibene nawe(abadala,abancinci)? *Including yourself, how many people (adults and children) live in your house?*		Inani labantu: _____ # *of people:*
11.	Bangaphi abadala (iminyaka-16 nangaphezulu)bedibene nawe abahlala kule ndlu? *How many adults (aged 16 or older), including you, live in your house?*		Inani labadala:_____ # *of adults*
12.	Bangaphi abantwana (iminyaka -15 nanganeno) abahlala nawe? *How many children (aged 15 and under) live in your house?*		Inani labantwana:_____ # *of children*
13.	Ukhulelwe kangaphi (kudibene nesi isisu)? *How many times have you been pregnant (including current pregnancy)?*		inani lokukhulelwa: _____ # *of pregnancies:*
14.	Ingaba ubuzama ukuba nosana ngelixesha ufumanisa ukuba ukhulelwe (Kwesi isisu)? *Were you trying to have a baby when you found out you were pregnant (in this pregnancy)?*		Hayi/*No* = 0 Ewe/*Yes* = 1 Andazi/*I don't know* = 9
15.	Bangaphi abantwana obazeleyo? *How many children have you given birth to?*		Inani labantwana:_____ # *of children* **Ukuba = 0,** Gqithela ku Q20 ***If 0, SKIP to Q20***
16.	Bangaphi kwaba bantwana abaphilayo? *How many of these children are living?*		Inani labantwana:_____ # *of children*
17.	Bangaphi kwaba bantwana abahlala nawe ngoku? *How many of these children currently live with you?*		Inani labantwana:_____ # *of children*
18.	Bangaphi kwaba bantwana ekufumaniseke bakho ukuba baphila nentsholongwane? *How many of your children have tested HIV-positive?*		Inani labantwana abaphila nentsholongwane:_____ # *of HIV-positive children*
19.	Bangaphi kwaba bantwana baphila nentsholongwane abasaphilayo? *How many of these children who have tested HIV- positive are currently living?*		Inani labantwana abaphila nentsholongwane abaphilayo ngoku: _____ # *of HIV-positive children currently alive*

Initials of counsellor: _____

Form 1 page 3. MCH-ART demographics & medical history, Phase 1

MCH-ART: Demographics & Medical History, Phase 1 PID: 1 - __ __ __ __ - __ __
Xhosa-English of Version 3.0, 15 October2013

20.	Uya thandana ngoku? *Are you currently in a relationship?*	Hayi/*No* = 0→ **Gqithela ku Q25** ***SKIP to Q25*** Ewe/*Yes*= 1
21.	Ungaluchaza njani uthando lwakho? *How would you describe your current relationship?*	Utshatile = 1 *Married* Anditshatanga ,ndiya hlalisana =2 *Not married, living together* Nditshatile, asihlali kunye = 3 *Married, not living together* Anditshatanga, asihlali kunye = 4 *Not married, not living together* Enye = 5, cacisa:_____ *Other, specify*
22.	Lileshe ellingakanani unobudlelwana nalomntu? *How long have you been in a relationship with this person?*	Ixesha Inyanga *Months*_____ *Duration in:* Iminyaka *Years* _____
23.	Ingaba eli qabane lakho ngutata womnye wabantwana bakho(kunye nalo umkhulelweyo)? *Is your current partner the parent of any of your children? (including current pregnancy)*	Hayi/*No* = 0 Ewe/*Yes* = 1
24.	Ulichazele na iqabane lakho ngesimo sakho sentsholongwane? *Have you disclosed your HIV status to your current partner?*	Hayi/*No* = 0 Ewe/*Yes* = 1
25.	Ubukhe wabelana ngesondo nabanye abantu ingenguye lomntu uthandana naye? *In the last 12 months have you had any sexual relationships/sexual partners? (if in a relationship then other than this partner)*	Hayi/*No* = 0 → **Gqithela ku Q28** **→ *SKIP to Q 28*** Ewe/*Yes* = 1
26.	Bunjani ubudlelwanebakho namanye amaqabane ngaphandle kweqabane lakho langoku ukuba akhona? *What is the nature of your relationship(s)? (other than current partner if applicable)* Rhangqa konke okungqamene nawe. *Mark all that apply.*	a. Umlingane/nditshatile *Spouse/ married* b. Iqabane lam *Boyfriend* c. Iqabane lethutyana *Casual Partner/One Night Stands* d. Omnye ,cacisa:_____ *Other, specify*
27.	Ubaxelele aba bantu wabelana nabo ngesondo ukuba uphila nentsholongwane? *Have you disclosed your HIV status to any of these other sexual partners?*	Hayi/*No* = 0 Ewe/*Yes* = 1
28.	Ubuqala ukufumanisa ukuba unentsholongwa kagawulayo kolumitho okanye phambi kokuba ukhulelwe? *Did you first test HIV positive <u>in this pregnancy</u> or <u>before this pregnancy</u>?*	Koku ukukhulelwa =1 → Gqithela ku Q32 *In his pregnancy* ***SKIP to Q32*** Phambi koku ukukhulelwa =2 *Before this pregnancy*
29.	Kwakunini ukuqala kwakho ukufumanisa ukuba unentsholongwane kagawulayo? *When did you 1st test HIV-positive?*	Umhla:___ Inyanga:_____ Unyaka:_____ Day Month Year
30.	Kwakutheni ukuze oluhlolo lwenziwe? *Why was this test conducted?*	Ndivavanywe ngelixesha ndikhulelweyo = 1 *Tested during pregnancy* VCT/Ndandifuna ukuvavanywe =2 *VCT/Wanted to be tested* Ndafunyaniswa ndinesifo sephepha (TB) = 3 *Diagnosed with TB* Ndangeniswa esibhedlele = 4 *Admitted to the hospital* Enye = 5, cacisa:_____ *Other, specify*

Initials of counsellor: _____

Form 1 page 4. MCH-ART demographics & medical history, Phase 1

MCH-ART: Demographics & Medical History, Phase 1 PID: 1 - __ __ __ __ - __ __
Xhosa-English of Version 3.0, 15 October2013

31.	Ingaba wawukhulelwe ukuqala kwakho ukufumane ukuba unentsholongwane kagawulayo? *Were you pregnant when you first tested HIV-positive?*	Hayi/*No* = 0 Ewe/*Yes* = 1
32.	Wakhe wanazo iziphumo ezingena chaphaza kuvavanyo lwentsholongwane kagawulayo? *Have you ever tested negative on an HIV test?*	Hayi/*No* = 0 →Gqithela ku Q36 ***SKIP to Q36*** Ewe/*Yes* = 1
33.	Ugqibele nini ukuba neziphumo ezingenachaphaza zovavanyo lwentsholongwane kagawulayo? *When did you last test HIV-negative?*	Umhla:___ Inyanga:_____ Unyaka:_____ Day Month Year
34.	Kwakutheni ukuze uvavanywe ngelo xesha? What was the reason for you doing the HIV test? *Why did you test at that time?*	Ndivavanywe ngelixesha ndikhulelweyo = 1 *Tested during pregnancy* VCT/Ndandifuna ukuvavanywe =2 *VCT/Wanted to be tested* Ndafunyaniswa ndinesifo sephepha (TB) = 3 *Diagnosed with TB* Ndangeniswa esibhedlele = 4 *Admitted to the hospital* Enye = 5, cacisa:_____ *Other, specify*
35.	Wawukhulelwe ngeloxesha uvavanyelwa intsholongwane? *Were you pregnant at the time of that test?*	Hayi/*No* = 0 Ewe/*Yes* = 1
36.	Wakhe waxelela nabanina ukuba unentsholongwane kagawulayo? *Have you told anyone that you are HIV-positive?*	Hayi/*No* = 0 →Gqithela ku Q39 ***SKIP to Q39*** Ewe/*Yes* = 1
37.	Ngawaphi amlungu osapho lwakho owaxeleleyo ngesimo sakho sentsholonwane? *Which of your family members have you told about your HIV status?* Nceda phendula lombuzo ngelungu ngalinye losapho oludweliswe ngezantsi. *Please answer this question for each of the family members listed below.* Wamxelele u_ _ _ _ _ _ _ ukuba unentsholongwane kagawulayo? *Have you told your _____ that you are HIV positive?*	
a.	Umyeni/*iqabane* *Husband/partner/boyfriend*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
b.	Umama *Mother*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
c.	Utata *Father*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
d.	Udade *Sister*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
e.	Umtakwenu *Brother*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
f.	Intombi *Daughter*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
g.	Unyana *Son*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
h.	Umalume *Uncle*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
i.	U-anti *Aunt*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9

Initials of counsellor: _____

Form 1 page 5. MCH-ART demographics & medical history, Phase 1

MCH-ART: Demographics & Medical History, Phase 1 PID: 1 - __ __ __ __ - __ __
Xhosa-English of Version 3.0, 15 October2013

j.	Umza wesikhomo *Male cousin*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
k.	Umza wesikhomokazi *Female cousin*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
l.	Enye indoda yalapha *Other male family member*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
m.	Esinye isikhomokazi *Other female family member*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
38.	Ngaphandle kwabantu bakowenu aba badweliswe ngentla,ngubani omnye umntu owamxelelyo ukuba uphila nentsholongwane?(funda uphendule yonke imibuzo) *Aside from family members listed above, who else have you told about your HIV status? (read and answer for all)*	
a.	Amanesi/ogqira *Health professionals*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
b.	Iqumru lenxaso labantu abaphila nentsholongwane *Support group*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
c.	Umntu owabelana naye ngesondo ongahlali naye *A sexual partner who does not live with you*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
d.	Isihlobo *Friends*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
e.	Inkokheli ngokwa kwamoya *Spiritual leader*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
f.	Umntu okuqashileyo/wayekuqashile *Current or former employer*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
g.	Ukuchaza esidlangalaleni *Public disclosure/ community*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
h.	Abanye, chaza: _____ *Other, specify*	Hayi/*No* = 0 Ewe/*Yes* = 1 N/A = 9
39.	Wakhe wakhulelwa phambi koku ukukhulelwa? *Have you ever been pregnant before this pregnancy?*	Hayi/*No* = 0 →Gqithela ku Q45 ***SKIP to Q45*** Ewe/*Yes* = 1
40.	Ngokuya ubukhulelwe ngaphambi koku ukukhulelwa wawuke wanikwa amayeza okhusela usana lungosuleleki yintsholongwane (ezeku khusela umntwana hayi amachiza okutho malalisa intsholongwane wobomi bonke) *When you were pregnant before this pregnancy have you ever been given medication at the clinic to keep your baby from getting HIV infected? (prophylaxis NOT lifelong ART)*	Hayi/*No* = 0 →Gqithela ku Q45 ***SKIP to Q45*** Ewe/*Yes* = 1
41.	Ukuba nguEwe, zingaphi izisu ufumane la machiza ngesisizathu? *If yes, during how many pregnancies have you received medication for this purpose?*	Inani lezisu:_____ *# of pregnancies*

Initials of counsellor: _____

Form 1 page 6. MCH-ART demographics & medical history, Phase 1

MCH-ART: Demographics & Medical History, Phase 1 PID: 1 - __ __ __ __ - __ __
Xhosa-English of Version 3.0, 15 October2013

42.	Kwezi zisu siyi____ofumene kuzo amachiza, zingaphi izisu otye kuzo iipilisi ngelixesha ubelekayo qha? *For the ___ pregnancies that you received medication, For how many pregnancies did you take pills while you were pregnant and for how many pregnancies did you take pills only at delivery?*	Ngoku wawubeleka *Only at Delivery (Nevirapine) #:*_____ Ngelixesha ukhulelwe *While you were pregnant (AZT)? #:* _____
43.	Bekunini ukugqibela kwakho ukufumana la machiza ngesisizathu? *When was the last time that you received medication for this purpose?*	Umhla:___ Inyanga:_____ Unyaka:_____ Day Month Year
44.	Uwafumene phi la machiza ukugqibela kwakho? *Where did you receive the medication the last time?*	Igama lekliniki:_____ *Name of clinic:*
45.	Wawuke wawathatha amachiza okuthomalalisa intsholongwane (awobomi bakho bonke) *Have you ever taken triple drug antiretroviral therapy (lifelong ART)?*	Hayi/*No* = 0 → SKIP to Q51 Ewe/*Yes* = 1
46.	Ukuba nguEwe, ingaba wawafumana amachiza okuthomalalisa intsholongwane ukugqibela kakho? *If yes, where did you receive ART the last time?*	Igama lekliniki:_____ *Name of clinic:*
47.	Uqale nini ukutya la machiza okuthomalalisa intsholongwane kagawulayo? *When did you start taking ART?*	Umhla:___ Inyanga:_____ Unyaka:_____ Day Month Year
48.	Usawatya amachiza okuthomalalisa intsholongwane kagawulayo? *Are you still on ART?*	Hayi/*No* = 0 Ewe/*Yes* = 1→ SKIP to Q51
49.	Ukuba nguHayi,uyeke nini ukuwatya amachiza okuthomalalisa intsholongwane kagawulayo? *If No, when did you stop taking ART?*	Umhla:___ Inyanga:_____ Unyaka:_____ Day Month Year

Initials of counsellor: _____

Form 1 page 7. MCH-ART demographics & medical history, Phase 1

MCH-ART: Demographics & Medical History, Phase 1 PID: 1 - __ __ __ __ - __ __
Xhosa-English of Version 3.0, 15 October2013

50.	Uyekele ntoni ukutya amachiza athomalalisa intsholongwane? *Why did you stop taking ART?* (rhagqa zonke ezibhekisa kuwe) *Circle all that apply*	a. Ndaphelelwa ngumchiza andaya ukuyakuwalanda *I ran out of medicine and didn't go for refills* b. Anencasa embi *The medicine tastes bad* c. Ndulibala *I just forgot* d. Bendikhathazwa yimiphumela yawo *I was worried about the side effects* e. Bendingafuni abanye bandiqaphele ukuba nditya amachiza *I did not want others to notice me taking the medicine* f. Ndandigula *I was ill* g. Ndacinga ukuba andisawafuni nganto *Didn't think I needed it anymore* h. Bendicinga ndingahlala ndiphilile ngaphandle kwawo *Can stay healthy without it* i. Bendicinga ukuba lamayeza anganobu ngozi kum. *I felt the medicine might be harmful to me* j. Ndizive ndinoxinizelelo *I felt depressed* k. Ndandiphilile *I was well* l. Ebemaninzi la machiza ekufuneka ndiwathathe *There was too much medicine to take* m. Bendingekho ekhaya *I was away from home* n. Bendixakekile zezinye izinto *I was busy with other things* o. Ndiye ndafunda ukuba zikho ezinye iindlela endinganyanga okanye ndiphilise intsholongwane kagawulayo *I learned that there are other ways to treat or cure HIV* p. Enye, cacisa: _____ *Other, Specify*
51.	Ubukhe watshaya isagarethi kulenyanga iphelileyo? *Did you smoke cigarettes in the last month?*	Hayi *No* = 0 → END Ewe *Yes* = 1
52.	Utshaya isigarethi ezingaphi ngemini? *How many cigarettes do you smoke in a day?*	#_____ cigarettes

Date completed: _ _ /_ _ _ / _ _ _ _ Signed counsellor completing CRF: _____

Date of QC: _ _ /_ _ _ / _ _ _ _ Signed measurement nurse: _____

Initials of counsellor: _____

Form 2 page 1. MCH-ART infant feeding intentions/practices, Phase 2 late 3rd trimester

MCH-ART: Infant feeding intentions/practices, Phase 2 late 3rd trimester PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.0, 27 Jan 2013

INFANT FEEDING EXPERIENCE AND INTENTIONS		Visit Date: __ __/__ __ __/__ __ __ __
Ngoku siza kubuza imibuzongabantwana onabo ngaphambi koku ku khulelwa. *Now I am going to ask you questions about the children you had before the one you are carrying now:*		
1.	Unabo abantwana ngaphambili? *Have you had children before?*	Hayi *No* = 0 → Gqithela ku Q6 *SKIP to Q6* Ewe *Yes* = 1
2.	Wake wamncancisa omnye wabantwana bakho? *Did you ever breastfeed any of your children?*	Hayi *No* = 0 → Gqithela ku Q4 *SKIP to Q4* Ewe *Yes* = 1
3.	Umncancise ixesha elingakanani umntwana wakho wokugqibela? *For how long did you breastfeed your lastborn child?*	_____ nyanga/ months _____ Iminyaka/ years Usancancisa/ Still breastfeeding = 0
4.	Umntwana wakho wokugqibela wayengakanani ukuqala kwakho ukumnika amanzi /ijusi? *How old was your last born child when you for the first time introduced water or any other water/juice like liquid?*	Ubungakanani bomntwana *child's age:* _____ nyanga *months* _____ minyaka *years*
5.	Ebengakanani umntana wakho wokugqibela ukuqalisa kwakho ukumnika ubisi lwenkomo,ipapa okanye okunye ukutya? *How old was the last born child when you for the first time introduced animal milk, porridge or any feeds?*	Ubungakanani bomntwana *child's age:* _____ nyanga *months* _____ minyaka *years*
Ngoku ndiza kubuza imibuzo ngomntwana lo umkhulelweyo: *Now I will ask you questions about the child you are expecting:*		
6.	Uceba ukulondla njani olu sana kwezi nyanga zokuqala luzelwe? *How do you plan to feed your baby in the first month after birth?*	Ukulincancisa ibele kuphela=1 *Breastfeed only* Ubisi lomgubo kuphela=2 *Formula feed only* Ukumnika ubisi lwenkomo /namanzi=3 *Only give other liquids like cow's milk/water* Ndiluncancise ndilunike nezinye intlobo eziselwayo=4 *Breastfeed and give other liquids* Ndiluncancise ndilunike ukutya okuthambileyo /nokungathambanga=5 *Breastfeed and give other solid/semi-solid foods* Okunye =6,cacisa:_____ *Other, specify*
7.	Ukuba uceba ukulincancisa ibele: Uya kulincancisa ixesha elingakanani ***If planning to breastfeed:*** *How long do you think that you will breastfeed your baby?*	_____veki/*weeks* *OR* _____ nyanga/*months* *OR* _____minyaka/ *years* Andazi/*Don't know*

Date completed: __ __ /__ __ __ / __ __ __ __ Signed counsellor completing CRF: _____

Date of QC: __ __ /__ __ __ / __ __ __ __ Signed measurement nurse: _____

Initials of counsellor: _____

Form 3 page 1. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

	Visit Date: __ __/__ __ __/__ __ __ __
Ukuqalisa ukuncancisa ***Initiation of breastfeeding:***	
1. Wakhe waluncancisa ibele usana lwakho? *Have you ever given breast milk to your baby?*	Hayi *No* = 0 → Gqithela ku Q5 *SKIP to Q5* Ewe *Yes* = 1
2. Ulubeke nini usana ebeleni emva kokuba ubelekile? *When did you put the baby to the breast after birth?*	Kwiyure yokuqala =1 *Within the first hour* Emva kweyure yokuqala ukya kwiyure ezi-12=2 *After the first hour and up to12 hours* Emva kweyureezi-12 ukuya kwiyure ezi-24=3 *After 12 hours and up to 24 hours* Emva kweyure ezi-24 ukuya kwiyure ezi-48(usuku lwe-2)=4 *After 24 hours and up to 48 hours (2nd day)* Emva kweyure ezi-48 ukya kwiyure ezi-72(usuku lwe-3)=5 *After 48 hours and up to 72 hours (3rd day)* Emva kweyure ezi-72(emva kosuku lwe-3)=6 *After 72 hours (After the 3rd day)*
3. Ubisi lokuqala ulunike usana okanye ulikhamile walilahla? *Did you give the first milk to the baby or did you express and discard it?*	Ndilunikile usana=1 *Gave the first milk* Ndilikhamile,ndalulahla elokuqala=2 *Expressed and discarded the first milk* Omabini ndimnikile ndakhama=3 *Both gave and expressed it* Enye=4, cacisa:_____ *Other, specify*
4. Emva kwentsuku ezi-3 ubelekile,usana lwanikwa enye into ngaphandle kobisi lwebele? *Within the first three days after birth, was your baby given anything to drink other than breast milk?*	Hayi *No* = 0 → Gqithela ku Q6 *SKIP to Q6* Ewe *Yes* = 1 Andazi= 9 → Gqithela ku Q6 *Don't know* *SKIP to Q6*
5. Usana lwanika ntoni ukuba lincance kwintsuku ezi-3 lubelekiwe? *What was the child given to drink within the first 3 days after birth?* Rhangqa zonke awazingcamliswa *Read all, circle all that apply*	a. Amanzi *Water* b. Amanzi aneswekile *Water with sugar (or glucose)* c. Amanzi anetyuwa *Water with salt* d. Ubisi lwenkomo oluxutyiweyo *Diluted cow's milk* e. Ubisi lwenkomo olungaxutywanga *Not diluted cow's milk* f. Ubisi olungumgubo labantwana *Infant formula* g. Olungolunye ubisi olungumgubo *Any other powdered milk* h. Ipapa *Any porridge* i. Isophu *Any soup* j. Nayaphi na into engemanzi ibiyinxalezye yesiko *Any liquid as part of a ritual.* k. Utywala *Alcohol* l. Iyeza lesintu *Traditional medicine* m. Amayeza angekhoyo kuluhlu *Non-prescribed medicine* chaza/*specify:*_____ n. Amayeza akuluhlu avunyiweyo *Prescribed medicine,* chaza/*specify:*_____ o. Ubusi *Honey* p. Amanye *Other,* chaza/*specify:*_____

Form 3 page 2. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

6. Kwintsuku zokuqala usana lunikwe into lungcamle;amaqabaza ento okanye nganeno kunomlomo ogcweleyo? *Within the first days did the baby get anything to taste; a few drops of something or less than a mouth full?*	Hayi *No* = 0 → Gqithela ku Q8 *SKIP to Q8* Ewe *Yes* = 1 Andazi= 9 → Gqithela ku Q8 *Don't know SKIP to Q8*
7. Ukuba ewe,Yintoni eyanikwa usana lungcamle kwintsuku ezi-3 luzzelwe. ***If yes**, what was the child given to taste within the first 3 days after birth* Rhangqa zonke awazingcamliswa *Read all, circle all that apply*	a. Amanzi *Water* b. Amanzi aneswekile *Water with sugar (or glucose)* c. manzi anetyuwa *Water with salt* d. Ubisi lwenkomo oluxutyiweyo *Diluted cow's milk* e. Ubisi lwenkomo olungaxutywanga *Not diluted cow's milk* f. Ubisi olungumgubo labantwana *Infant formula* g. Olungolunye ubisi olungumgubo *Any other powdered milk* h. Ipapa *Any porridge* i. Isophu *Any soup* j. Nayaphi na into engemanzi ibiyinxalezye yesiko *Any liquid as part of a ritual.* k. Utywala *Alcohol* l. Iyeza lesintu *Traditional medicine* m. Amayeza angekhoyo kuluhlu *Non-prescribed medicine* chaza/*specify*:_____ n. Amayeza akuluhlu avunyiweyo *Prescribed medicine,* chaza/*specify*:_____ o. Ubusi *Honey* p. Amanye *Other,* chaza/*specify*:_____
Ukukhumbula indlela zokondla usana ***Infant feeding recalls:***	
8. Uyaluncancisa ibele usana lwakho kude kube ngoku *Are you currently breastfeeding your baby*	Hayi *No* = 0 Ewe *Yes* = 1→ *SKIP TO Q14*
9. Uluncancise ibele usana lwakho ixesha elingakanani *For how long did you breastfeed your child?*	Zange lube sebeleni=0 *Never breastfed* Iintsuku:_____ *Days* Andiyazi =9 *Do not know*
10. Zeziphi izizathu ezibangele uyeke ukuluncancisa usana/okanye ungaluncancisi *What were your reasons for stopping to breastfeed/not breastfeed your child?* *Read all, circle all that apply*	a. Umsebenzi *Work* b. Imfundo *Education* c. Ukugula,ngaphandle kwengxaki zokuncancisa *Illness, other than lactation problems* d. Ingxaki zokuncancisa *Lactation problems* e. Usana alukhuli kakuhle *Child not grow well* f. Usana lukhala kakhulu *Child crying a lot* g. Ubisi lwebele alwanelanga *Not enough breast milk* h. Andifuni ukumosulela ngentsholongwane *Did not want to give my baby HIV infection* i. Iingcebiso/ukunyanzeliswa ngabanye *Advice/pressure from others* j. Ezinye,cacisa:_____ *Other, specify*

Initials of counselor

Form 3 page 3. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

11. Uyeke njani ukuncancisa? *How did you stop breastfeeding?*	Andizanga ndancancisa=0 Never breastfed Ndimlumlile kancinci ndamnika olunye ubisi emva kwentsuku ezimbalwa=1 *Gradually changed to other replacement milk over a period of days* Ndimlumlile kancinci ndamnika ubisi emva kweveki ezimbalwa=2 *Gradually change to other replacement milk over a period of weeks* Ndimlumlile kancinci ndamnika ubisi mva kwenyanga ezimbalwa=3 *Gradually change to other replacement milk over a period of months* Ndiluhambisile usana iintsuku ezimbzlw=4 *Sent the child away for some days* Ndiqabe into ebeleni usana alwalifuna ibele=5 *Put something on breast to make child refuse breast* Ndiluncancise ebusuku kuphela=6 *Only breastfed at night* Ndifumene iyeza ekliniki lokunqamla ubisi=7 *Got medicine from clinic to stop milk* Ndisebenzise iyeza lesi Xhosa lokunqamla/irati yokunqamla=8 *Took traditional medicine/remedy medicine to stop milk* Lingcebiso/uxiizelelo ngabaye=9 *Advice/pressure from others* Ezinye=10,cacisa:_____ *Other , specify*
12. Ikuthathe ixesha elingakanani ukumyekisa umphelo? *How long did it take you to stop all breastfeeding?*	Iintsuku:_____ *Days*
13. Uceba ukuluncancisa olu sana kaphinda? *Are you planning on breast feeding this baby ever again?*	Hayi *No* = 0 Ewe *Yes* = 1 Andazi=9 *Don't know*
14. Aye acandeka aphuma ubumdaka amabele,okanye wanengxaki emabeleni oko uhte walubeleka usana ? *Have you had any infection, or problem with your breasts since this child has been born?*	Hayi *No* = 0 → Gqithela ku- 17 "dietary 24 hour recall" *SKIP to Q17* Ewe *Yes* = 1
15. Ukuba ewe,ngxakini le? ***If yes**, what problem did you have?* Funda zonke , urhangqe ezenzekileyo *Read all, circle all that apply*	a. Ukudumba kwamabele *Engorgement (swollen painful breasts)* b. Iingono ezichachambileyo *Cracked nipples* c. isilonda ebeleni *Abscess (sore on the breast)* d. ulosuleleko *Infection* e. Uqhaqho *Operation* f. Umothuko *Trauma* g. Ezinye, cacisa *Other, specify:*_____

Form 3 page 4. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

16. Usana lwakho belunangaphi ukwenzeka kwa le nto? *How old was your baby when this occurred?*	Iintsuku :_____ *Days*
Dietary 24hr recall *We will now ask you some questions about your baby's feeding since yesterday morning*	
17. Ukuvuka kwakho izolo ekuseni kude ibe kukuvuka kwakho namhlanje ekuseni uye waluncancisa usana? *From the time you woke up yesterday morning till you woke up this morning did you breastfeed your baby?*	Hayi *No* = 0 → Gqithela ku- 20 *SKIP to Q20* Ewe *Yes* = 1
18. Ukuvuka kwakho izolo ekuseni wade walala ebusuku ,uluncancise kangaphi usana? *From the time you woke up yesterday morning till you went to bed last night, how many times did you breastfeed?*	a. _____ amaxa *# of times* b. _____ usana lulilela ibele *# of on demand feedings*
19. Ngelixesha uya kulala izolo kwade kwaba kukuvuka kwakho namhlanje ekuseni,uluncancise kangaphi usana? *From the time you went to bed last night till you woke up this morning, how many times did you breastfeed?*	c. _____ amaxa *# of times* d. _____ usana lulilela ibele *# of on demand feedings*
20. Ukuvuka kwakho izolo ekuseni kude kube kukuvuka kwkho namhlanje ekuseni:Ulunikile usana ezinye zezi zinto. Rhangqa zonke omnike zona. *From the time you woke up yesterday morning till you woke up this morning: Did you give any of the following items to the child?* ***Read ALL; please circle all that apply.*** Ukuba umnikile ,sixelele umnike kangaphi? *And if you did, will you please tell **how many times** you gave it?*	a. Amanzi: *Water, #_____* b. Amanzi aneswekile *Any water with sugar or glucose, #____* c. Ijusi yeziqhamo *Any fruit juice, #_____* d. Ingcambu emanzini *Any herbs in water, #_____* e. Iti engenabisi *Any tea without milk, #_____* f. Iti enobisi *Any tea with milk, #_____* g. amanzi erayisi *Rice water, #_____* h. Ubisi lwenkomo oluxutyiweyo *Diluted cow's milk, #_____* i. Ubisi lwenkomo olungaxutywanga *#_____* *Non diluted cow's milk,* j. Ubisi olungumgubo labantwana *Infant formula, #_____* k. Olungolunye ubisi olungumgubo *#_____* *Other powdered milk,* l. Ezinye izinto njenge yogati,itshizi,ikhrim *#___* *Any other dairy product like yoghurt, cheese or cream,* m. Ubisi lwebhokhwe *Goat's milk #___* n. Ipapa yabantwana,ipapa,okanye isonka, *#_____* *Cereals, porridge or bread,* o. Iziqhamo/vegi *Any fruits/vegetables, #_____* p. Inyama ,intlanzi *Any meat or fish, #_____* q. Amaqanda *Eggs, #_____* r. iGripe water *Gripe water, #_____* s. Amayeza abhalwe ngugqira *Any prescribed medicine, #_____* t. Amayeza angabhalwanga ngugqira, *#_____* *Any non-prescribed medicine,* u. Into ebutywalara njenge bhiya,umqombothi, *#_____* *Any alcohol like beer or brew,* v. Ezinye, cacisa:_____ #_____ *Other, specify* w. Nanye kwezi zikhankanywe ngentla *None of the above*

Form 3 page 5. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

Formula feeding *We would also like to ask you some questions about using infant formula milk*	
21. Umnika umntwana ubisi lomgubo? *Is the mother formula feeding?*	Hayi *No* = 0 → Gqithela ku-39 "leaving the child" *SKIP to Q39* Ewe *Yes* = 1
22. Yeyiphi indlela eqhelekileyo yokunika usana ubisi lomgubo? *What is the usual way that you feed the child formula milk?* Mthundeze xa iyimfuneko. *Prompt when necessary.*	Ibhotile = 1 *Bottles* Ikomityi necephe=2 *Cup and spoon* Ikomityi evulekileyo asele=3 *Open cup and drinking* Ikomityi enomngxunya wokusela=4 *Cup with drinking spout* Ezinye=5 *Other* Andazi=9 *Don't know*
23. Zingaphi ezinye zezi zinto onazo ezisetyenziselwa ukondla usana? *How many of each of the following items do you have that are for infant feeding?* Nika inani lonazo ngento nganye. *Provide a number for each item that applies.*	a. Ibhotile *Bottles*: # _____ b. Ikomityi *Cups* :#_____ c. Ikomityi zokondla ezinemingxuma yokusela *Feeding cups with drinking spouts*: #_____ d. Ititi *Teats:* #_____ e. Ezinye, cacisa into : _____ #_____ *Other, specify item*
Kuyakhuthazwa ukuxuba/ulungise isidlo esinye sobisi lomgubo ngexesha, kwaye ungalugcini olushiyeluley ubisi, kodwa abanye omama bafumanisa kulula kwaye kungabizi ukuxuba ubisi olungu mgubo lwabantwana olwanele ngaphezu kwesidlo esinye, banika inxenye yobisi kwisidlo esinye kwaye bongele isininzi sobisi isidlo esilandelayo. Ngoku sizakubuza eminye imibuzo malunga nokuba ukukhetha ukuxuba kwaye utyise ngayo umntwana wakho amaxesha amaninzi: *It is recommended to only mix/prepare one feed of formula milk at a time, and not store left over milk. However, some mothers find it easier, and cheaper, to mix enough formula for more than one feed; they give some of the milk for one feed and save the rest of the milk for the next feed. We are now going to ask some questions about how you choose to mix and feed your baby most of the time:*	
24. Kukangaphi ngemini (iiyure ezi -24)ulungisa ubisi lomgubo xa usana luza kuncanca. (Kukangahpi uxuba ubisi lomgubo,hayi amaxa omncancisa ngawo) *How many times during a day (i.e. in a 24 hour period) is the formula normally prepared for the child? (Number of times the formula is mixed, not number of times given)*	_____ amaxesha *times*
25. Lubisi olungakanani lomgubo wabantwana oqhele ukululungisa ngexesha elinye (hayi ubungakanani obutyisa umntwana kwisidlo esinye)? *How much formula is normally prepared at one time (not how much is fed to the baby in one feed)?* Mthundeza xa kuyimfuneko *Prompt when necessary.*	75ml 100ml 125ml (1/2 yebhotile=1bhotile encinci)) 150ml 175ml 200ml 250ml (1 bhotile enkulu) 500ml 1 litre Eminye, cacisa :_____ (mls) *Other, specify* Andazi/ *Don't know* = 9

Form 3 page 6. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

26. Umncancisa ubisi lomgubo olungakanani ngexesha? *How much formula is fed to the child each time?*	_____ (mls)
27. Xa ubisi lomgubo wabantwana selulungisiwe (luxutyiwe), ulubekaphi ubisi oselulungisiwe kude ube uyamtyisa umntwana/phakathi kokutyisa umntwana?? *When the formula has been prepared (mixed), where is the prepared formula stored until/between feeding the baby?* Mthundeze xa kuyimfuneko. *Prompt when necessary.*	Egumbini: lugqunyiwe=1 *Room; covered* Egumbini ;lungagqunywanga=2 *Room; uncovered* Kwisikhencisi=3 *Refrigerator* Eflaskini lupholisiwe=4 *Flask: cooled first* Andilugcini,ndilunika ngoko=5 *Do not store, give it directly* Ezinye=6 cacisa:_____ *Other, specify* Andazi=9 *Don't know*
28. Anjani amanzi owenza ngawo ngesiqhelo ubisi? *How was the water you use for the child's formula feeds normally prepared?* Aphendule kubekanye ungamthundezi *One response only, do not prompt.*	Billisa phambi kokunika usana=1 *Boil before each feed* Bilisa kanye ngemini agcinwe:egqunyiwe=2 *Boil once a day and store it: covered* Hluza=3 *Filter* Linda acwenge=4 *Allow to settle* Galela iblitshi=5 *Bleach* Andenzi nto=6 *Nothing* Bilisa,gcine amanzi ashushu eflaskini=7 *Boil, store hot water in flask* Ezinye=8 cacisa:_____ *Other, specify* Andazi=9 *Don't know*
29. Ubisi lomgubo ulufumana esibhedlele /kliniki losana lwakho? *Are you currently receiving formula milk from the hospital/clinic for your infant?*	Hayi *No* = 0 →SKIP to Q32 Ewe *Yes* = 1
30. Oko usana lwakho walubeleka ukhe waya ekliniki uyokulanda ubisi wafumanisa lungekho? *Since your baby was born have you been to the clinic to collect milk and found that they were out of stock?*	Hayi *No* = 0 → Gqithela ku-32 *SKIP to Q32* Ewe *Yes* = 1
31. Yenzeke kangaphi le nto oko walubeleka usana? *How many times has this happened since your baby was born?*	_____ amaxesha *# times*
32. Oko usana walubeleka sewukhe waluthenga ubisi? *Since your child's birth have you purchased any formula milk for your infant?*	Hayi *No* = 0 Ewe *Yes* = 1

Form 3 page 7. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

33. Oko usana walubeleka wakhe waphelelwa lubisi? *Since your child's birth have you run out of formula milk?*	Hayi *No* = 0 → Gqithela ku-36 *SKIP to Q36* Ewe *Yes* = 1
34. Ithathe ixesha elingakanani? *How many days did this last?*	Iintsuku :_____ *Days*
35. Uluncancise ntoni usana ngeli xesha? *What did you feed the baby during this time?* Rhangqa zonke omnike zona *Circle all that apply*	a. Ubisi lwebele *Breast milk* b. Ipapa *Porridge* c. Amanzi *Water* d. Amanzi aneswekile *Sugar and water* e. Iti *Tea* f. Ndiluthengile *Purchased formula* g. Ijusi *Juice* h. Ezinye,cacisa:_____ *Other, specify*
36. Unalo ubisi lomgubo namhlanje endlini? *Do you have any formula in the house today?*	Hayi *No* = 0 Ewe *Yes* = 1
37. Wakhe waluncancisa usana lwakho oko waluzala ,umz.xa luza kulala,ebusuku ebhedini,xa lulila? *Have you ever put your baby to the breast since birth e.g. to go to sleep, in bed at night time, when crying?*	Hayi *No* = 0 Ewe *Yes* = 1
38. Wakhe wabona ezikliniki amaphepha apapasha ngobisi lomgubo? *Have you seen adverts at any health clinic advertising formula milks?*	Hayi *No* = 0 Ewe *Yes* = 1
Questions about leaving the child	
39. Sewukhe wohlukana nosana lwakho oko walubeleka kwenzeka ancanciswe ngomnye umntu? *Have you ever been separated from your child since childbirth so that someone else has fed the child?*	Hayi *No* = 0 → *SKIP TO Q41* Ewe *Yes* = 1
40. Luye lwancanciswa ntoni usana oku kokugqibela ungekho? *What did they feed the child the last time you were away?* Rhangqa zonke ezenziweyo *Circle all that apply*	a. Umxube wamanzi *Water based liquids* b. Umxube wobisi/ukutya okuthambileyo *Milk based liquids/semi-solid feeds* c. Ubisi lwam lwebele ebendilukhamile *My own expressed breast milk* d. Usana beluncanciswe ibele ngomnye umdlezana *The child was "wet nursed" (breastfed by another woman)* e. Ubisi lomgubo *Formula milk* f. Ukutya ebendikuhlafunile kosana *Food that I chewed for the baby* g. Andazi *Do not know* h. Enye,cacisa :_____ *Other, Specify*

Initials of counselor

Form 3 page 8. MCH-ART infant feeding intentions/practices, Phase 2 <7days postpartum

MCH-ART: Infant feeding intentions/practices, Phase 2 <7days pp PID: 2 - __ __ __ __ - __ __
Xhosa-English Version 2.5, 18 Feb 2014

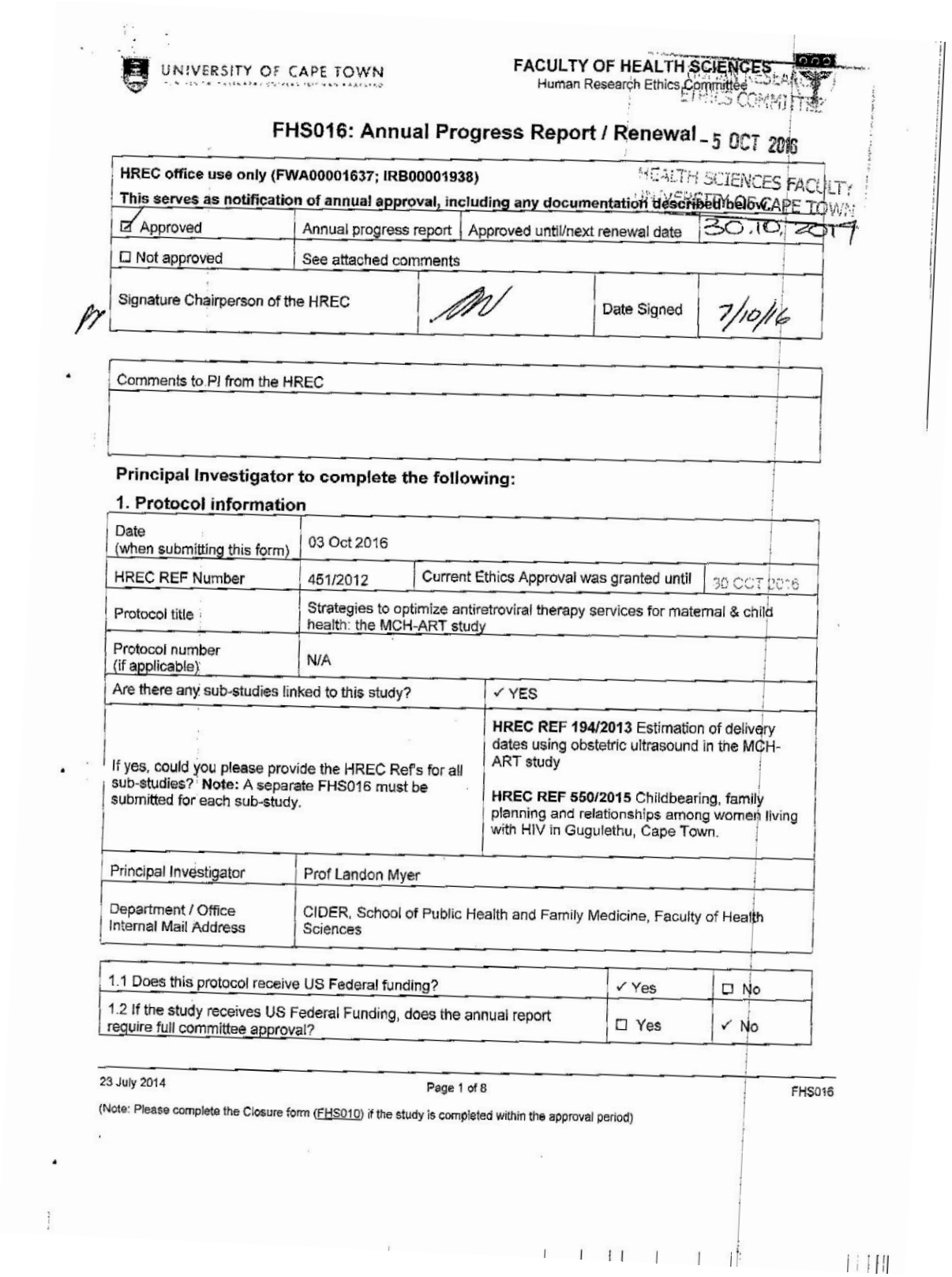
Last questions about formula and breastfeeding: *We will now ask you only five more questions about formula and breastfeeding*	
41. Ngawaphi kulamayeza atyiwa lusana lwakho:Which of these medicines is your baby currently receiving: *Show the mother a range of possible medicines: multivitamins, iron drops, nevirapine, cotrimoxazole, TB treatment and antibiotics* Rhangqa zonke ezenziweyo *Circle all that apply*	a. Multivitamins (eg. Kiddievite) b. Iron drops c. Zinc syrup d. Nevirapine e. Co-trimoxazole(or Bactrim/Trimethoprim-Sulphamethoxazole / Resmed / Iantibiotic ukukhusela ulwasuleleko lwesifuba (*antibiotic to prevent chest infection*)) f. TB drugs g. Antibiotics h. Enye,cacisa *Other, specify*_____ i. Umntwana akanamayeza awatyayo *Baby is not currently on any medication*
42. Ebengakanani umntwana ukuqala kwakho ukumnika ezinye izinto ngaphandla kwebisi lebele okanye amayeza? Ngamany'amazwi, ebengakanani yena xa wayeqala ukufumana amanzi okanye ukutya okanye ubisi lomgubo wabantwana? *How old was the baby when you FIRST gave him/her anything other than breast-milk or medicine to drink? In other words, how old when he/she first had any water or food or formula milk?*	Zange ndamnika enye into umntwana ngaphandle kwebisi lwebele = 0 →Phela apha/ *END* *Have only given baby breastmilk and medicine since birth* OR Indicate age in weeks: #_____ Andiqinisekanga *Unsure* = 9
43. Ukusuka kwixesha ovuke ngalo kusasa izolo kude kuye ekuvukeni kwakho kusasa nje, ubukhe wamnika umntwana wakho ubisi olungumgubo lwabantwana? *From the time you woke up yesterday morning till you woke up this morning did you give your baby any formula milk?*	Hayi *No* = 0 →Phela apha/ *END* Ewe *Yes* = 1
44. Ukusuka kwixesha ovuke ngalo kusasa izolo kude kubelixesha lakho lokulala, umncancise kangaphi umntwana wakho ubisi olungumgubo lwabantwana? *From the time you woke up yesterday morning till you went to bed last night, how many times did you feed your baby formula milk?*	_____ amaxa *# of times*
45. Ukusuka kwixesha ovuke ngalo kusasa izolo kude kube kukuvuka kwakho kusasa nje, umncancise kangaphi umntwana wakho ubisi olungumgubo lwabantwana? *From the time you went to bed last night till you woke up this morning, how many times did you feed your baby formula milk?*	_____ amaxa *# of times*

Date completed: __ __ /__ __ __ / __ __ __ __ Signed counsellor completing CRF: _____

Date of QC: __ __ /__ __ __ / __ __ __ __ Signed measurement nurse: _____

Page **8** of **8** Initials of counsellor

Appendix C. Ethics approval from the UCT-HREC: the MCH-ART Study



UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

HUMAN RESEARCH ETHICS COMMITTEE

5 OCT 2016

HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30.10.2017
☐ Not approved	See attached comments		
Signature Chairperson of the HREC		Date Signed	7/10/16

Comments to PI from the HREC

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	03 Oct 2016		
HREC REF Number	451/2012	Current Ethics Approval was granted until	30 OCT 2016
Protocol title	Strategies to optimize antiretroviral therapy services for maternal & child health: the MCH-ART study		
Protocol number (if applicable)	N/A		
Are there any sub-studies linked to this study?	✓ YES		
If yes, could you please provide the HREC Ref's for all sub-studies? **Note:** A separate FHS016 must be submitted for each sub-study.	**HREC REF 194/2013** Estimation of delivery dates using obstetric ultrasound in the MCH-ART study **HREC REF 550/2015** Childbearing, family planning and relationships among women living with HIV in Gugulethu, Cape Town.		
Principal Investigator	Prof Landon Myer		
Department / Office Internal Mail Address	CIDER, School of Public Health and Family Medicine, Faculty of Health Sciences		

1.1 Does this protocol receive US Federal funding?	✓ Yes	☐ No
1.2 If the study receives US Federal Funding, does the annual report require full committee approval?	☐ Yes	✓ No

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Ethics approval from the UCT-HREC: Candidate Dr C Van De Venter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6626
Email: shurette.thomas@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

13 June 2017

HREC REF: 213/2017

Prof Landon Myer
Public Health & Family Medicine
Falmouth Building

Dear Prof Landon Myer

PROJECT TITLE: PRE-NATAL FEEDING INTENTIONS VERSUS POST-PARTUM FEEDING PRACTICES IN INFECTED WOMEN ON ANTI-RETROVIRAL THERAPY: A COHORT STUDY (Masters-candidate- Dr C van der Venter)

Thank you for submitting your response to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 June 2018.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval before the research may occur.

The HREC acknowledge that the student, Dr Claudine van de Venter will also be involved in this study.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

Ethics renewal from the UCT-HREC: Annual progress report/renewal

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

HUMAN RESEARCH ETHICS COMMITTEE
26 JUN 2018
HEALTH SCIENCES FACULTY

FHS017: Annual Progress Report / Renewal

Record Reviews/Audits/Collection of Biological Specimens/Repositories/Databases/Registries

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30.6.2019
☐ Not approved	See attached comments		
Signature Chairperson of the HREC		Date Signed	26/6/18

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	June 2018		
HREC REF Number	213/2017	Current Ethics Approval was granted until	30 June 2018
Protocol title	Pre-natal feeding intentions versus post-partum feeding practices in HIV-infected women on anti-retroviral therapy: a cohort study		
Principal Investigator	Prof. Landon Myer		
Department / Office Internal Mail Address	Public Health and Family Medicine, Falmouth Building		
1.1 Does this protocol receive US Federal funding?		☐ Yes	X No

2. Protocol status (tick ✓)

☐	Research-related activities are ongoing
X	Data collection is complete, data analysis only

Please indicate (in the block below) the titles and HREC reference numbers of any projects currently making use of the Database/registry/repository.

3. Protocol summary

Total number of records or specimens collected, reviewed or stored since the original approval		584
Total number of records or specimens collected, reviewed or stored since last progress report		584
Have any research-related outputs (e.g. publications, abstracts, conference presentations) resulted from this research? If yes, please list and attach with this report.	☐ Yes	X No

4. Signature

Signature of PI		Date	26 June 2018

Appendix D: Supporting information

Sub analysis of characteristics of 572 HIV-infected women stratified by postpartum infant feeding practices.

Detailed descriptive characteristics of all women stratified by their EBF practices at their postpartum visit are summarized in S1 Table. Of the 572 women included in the analysis, 6% (n = 49) reported EBF whereas 91% (n = 523) had practiced either EFF or MF at or before seven days postpartum. Demographic characteristics did not significantly differ between those who EBF and those who did not. Among the women who had not EBF, 31% (n = 160) had planned their pregnancy compared to the 18% (n = 9) of women who had practiced EBF (P = 0.073). Women who practiced EFF or MF were more likely to have disclosed their status to someone than those who practiced EBF (P = 0.049), although there was no significant difference in disclosure to a partner between the two groups. Compared to participants who were EFF or MF, those who were practicing EBF were more likely to be PMTCT naive (P = 0.028).

S1 Table. Characteristics of HIV-infected women stratified by exclusive breastfeeding (EBF) practice reported at or before seven days postpartum (n=572).

	Did EBF	**Did not EBF**	**Total**	
	n (%) or median (IQR)	n (%) or median (IQR)	n (%) or median (IQR)	P-value*
Number of women	49 (6)	523 (91)	572 (100)	-
Demographics				
Age	27 (24-30)	28 (25-32)	28 (24-32)	0.241
Language				
Xhosa	46 (94)	509 (97)	555 (97)	0.171
Other	3 (6)	14 (3)	17 (3)	
Education				
Primary	1 (2)	22 (4)	23 (4)	0.711
Secondary / Tertiary	48 (98)	501 (96)	549 (96)	
Employed				
Yes	18 (37)	198 (38)	216 (38)	0.877
No	31 (63)	325 (62)	356 (62)	
Employment Type				
Full time	12 (67)	120 (61)	132 (61)	0.614
Part time	6 (33)	78 (40)	84 (39)	
Housing				
House, flat, council flat	20 (41)	239 (46)	259 (45)	0.512

Shack & other	29 (59)	284 (54)	313 (55)	
Present within home				
Toilet				
Yes	10 (20)	148 (28)	158 (28)	0.238
No	39 (80)	375 (72)	414 (72)	
Running water				
Yes	18 (37)	213 (41)	231 (40)	0.586
No	31 (63)	310 (59)	341 (60)	
Electricity				
Yes	49 (100)	511 (98)	560 (98)	0.612
No	0 (0)	12 (2)	12 (2)	
Refrigerator				
Yes	41 (84)	425 (81)	466 (81)	0.678
No	8 (16)	98 (19)	106 (19)	
Landline Phone				
Yes	2 (4)	8 (2)	10 (2)	0.208
No	47 (96)	515 (98)	562 (98)	
Television				
Yes	47 (96)	484 (93)	531 (93)	0.564
No	2 (4)	39 (7)	41 (7)	
Total number of people living in home	4 (3-6)	4 (3-6)	4 (3-6)	0.858
Adults, 16 years and older	3 (2-4)	3 (2-4)	3 (2-4)	0.960
Children, 15 years and younger	1 (0-2)	1 (0-2)	1 (0-2)	0.754
Obstetric characteristics				
Current pregnancy intended				
Yes	9 (18)	160 (31)	169 (30)	0.073
No	40 (82)	363 (69)	403 (70)	
Gravidity				
1	10 (20)	90 (17)	100 (17)	0.573
≥1	39 (80)	433 (83)	472 (83)	
HIV history				
Children living	1 (1-2)	1 (1-2)	1 (1-2)	0.930
Children residing with mother	1 (0-2)	1 (0-1)	1 (0-1)	0.751
Children tested HIV+				
Yes	0 (0)	10 (2)	10 (2)	1.000
No	38 (100)	419 (98)	457 (98)	
Currently in a relationship				
Yes	49 (100)	507 (97)	556 (97)	0.384
No	0 (0)	16 (3)	16 (3)	
Disclosed status to partner				
Yes	13 (27)	184 (36)	197 (35)	0.173
No	36 (73)	323 (64)	359 (65)	
Disclosed status to anyone				
Yes	18 (37)	269 (51)	287 (50)	**0.049**
No	31 (63)	254 (49)	285 (50)	
Diagnosed				
In this pregnancy	31 (63)	279 (53)	310 (54)	0.183
Before this pregnancy	18 (37)	244 (47)	262 (46)	
ARV use[†]				
Previous PMTCT				
Yes	7 (18)	152 (35)	159 (34)	**0.028**
No	32 (82)	278 (65)	310 (66)	
Previous ART				
Yes	0 (0)	23 (4)	23 (4)	0.247
No	49 (100)	500 (96)	549 (96)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

† Previous PMTCT: prophylaxis, not lifelong ART. Previous ART: lifelong triple drug antiretroviral therapy

Sub analysis of characteristics of 572 HIV-infected women stratified by their BF status at or before seven days postpartum.

Detailed descriptive characteristics of all women stratified by their ever having EBF at their postpartum visit are summarized in S2 Table. A significantly higher percentage of women in the group who had never breastfed had disclosed their status to someone (P = 0.012), and specifically to their partners (P = 0.043). Of those diagnosed as HIV-infected during this study, the majority had initiated BF at some stage postpartum (P = 0.049). Most of the women had not used ART previously. Of those who had previously used ART, a greater proportion never breastfed their infants (P = 0.039).

S2 Table. Characteristics of HIV-infected women stratified by breastfeeding status at or before seven days postpartum (n=572).

	Ever Breastfed n (%) or median (IQR)	**Never Breastfed** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P-value*
Number of women	523 (91)	49 (9)	572 (100)[†]	-
Demographics				
Age	28 (24-32)	29 (26-32)	28 (24-32)	0.891
Language				
Xhosa	508 (97)	47 (95)	555 (97)	0.650
Other	15 (2)	2 (4)	17 (3)	
Education				
Primary	22 (4)	1 (2)	23 (4)	0.711
Secondary / Tertiary	501 (95)	48 (98)	549 (96)	
Employed				
Yes	196 (37)	20 (41)	216 (38)	0.645
No	327 (63)	29 (60)	356 (62)	
Employment Type				
Full time	118 (60)	14 (70)	132 (61)	0.392
Part time	78 (40)	6 (30)	84 (39)	
Housing				
House, flat, council flat	233 (45)	26 (53)	259 (45)	0.252
Shack & other	290 (55)	23 (47)	313 (55)	
Present within home				
Toilet				
Yes	145 (28)	13 (27)	158 (28)	0.858
No	378 (72)	36 (73)	414 (72)	
Running water				
Yes	210 (40)	21 (43)	231 (40)	0.712
No	313 (60)	28 (57)	341 (60)	
Electricity				
Yes	512 (98)	48 (98)	560 (98)	1.000
No	11 (2)	1 (2)	12 (2)	
Refrigerator				
Yes	429 (82)	37 (76)	466 (81)	0.262
No	94 (18)	12 (24)	106 (19)	

Landline Phone				
Yes	9 (2)	1 (2)	10 (2)	0.595
No	514 (98)	48 (98)	562 (98)	
Television				
Yes	485 (93)	46 (94)	531 (93)	1.000
No	38 (7)	3 (6)	41 (7)	
Total number of people living in home	5 (3-6)	4 (2-5)	5 (3-6)	0.208
Adults, 16 years and older	3 (2-4)	3 (2-3)	3 (2-4)	0.126
Children, 15 years and younger	2 (0-2)	1 (0-2)	1 (0-2)	0.497
Obstetric characteristics				
Current pregnancy intended				
Yes	151 (29)	372 (71)	169 (30)	0.209
No	18 (37)	31 (63)	403 (70)	
Gravidity				
1	93 (18)	7 (14)	100 (17)	0.538
≥1	430 (82)	42 (86)	472 (83)	
HIV history				
Children living	1 (1-2)	1 (1-2)	1 (1-2)	0.665
Children residing with mother	1 (0-2)	1 (0-1)	1 (0-1)	0.402
Children tested HIV+				
Yes	9 (2)	415 (98)	10 (2)	1.000
No	1 (2)	42 (98)	457 (98)	
Currently in a relationship				
Yes	509 (98)	47 (96)	556 (97)	0.639
No	14 (3)	2 (4)	16 (3)	
Disclosed status to partner				
Yes	174 (34)	23 (49)	197 (35)	**0.043**
No	335 (66)	24 (51)	359 (65)	
Disclosed status to anyone				
Yes	254 (49)	33 (67)	287 (50)	**0.012**
No	269 (51)	16 (33)	285 (50)	
Diagnosed				
In this pregnancy	290 (55)	20 (41)	310 (54)	**0.049**
Before this pregnancy	233 (45)	29 (59)	262 (46)	
ARV use				
Previous PMTCT				
Yes	140 (33)	19 (43)	159 (34)	0.172
No	285 (67)	25 (57)	310 (66)	
Previous ART				
Yes	18 (3)	5 (10)	23 (4)	**0.039**
No	505 (97)	44 (90)	549 (96)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

† Missing response for 1 participant, n = 572.

§ Difference in total due to missing response for 1 participant accounting for 6 months.

Sub analysis of 572 HIV-infected women's characteristics stratified by their congruence status as a result of either practicing or not practicing their prenatal infant feeding intentions postnatally.

Demographic, clinical and obstetric characteristics stratified by postpartum congruence status are displayed in S3 Table. Based on their exposure to the factors assessed in this study, 58 of the 572 women (10%) were congruent in their infant feeding intentions and practices before or at seven days postpartum. Demographic and obstetric characteristics did not significantly differ between those who were congruent and those who were not. Among the women who were congruent, 82% (n = 14) had full time employment compared to the 59% (n = 118) of women who were incongruent to their feeding intentions (P = 0.072). Overall, 65% (n = 359) of women chose not to inform their partner of their HIV-infected status even though 46% (n = 262) were aware of their status prior to their pregnancy and 30% (n = 169) had planned their pregnancy. Disclosure of HIV status significantly increased the chances of incongruent infant feeding (P = 0.049), and more so when disclosure was to a partner (P = 0.035).

S3 Table. Characteristics of HIV-infected women stratified by congruence of infant feeding intentions and practices at or before seven days postpartum (n=572).

	Congruent to feeding intentions n (%) or median (IQR)	**Incongruent to feeding intentions** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P-value*
Number of women	58 (10)	514 (90)	572 (100)[†]	-
Demographics				
Age	27 (25-32)	28 (24-32)	28 (24-32)	0.891
Language				
Xhosa	55 (95)	500 (97)	555 (97)	0.401
Other	3 (5)	14 (3)	17 (3)	
Education				
Primary	1 (2)	22 (4)	23 (4)	0.498
Secondary / Tertiary	57 (98)	492 (96)	549 (96)	
Employed				
Yes	17 (29)	199 (39)	216 (38)	0.161

No	41 (71)	315 (61)	356 (62)	
Employment Type				
Full time	14 (82)	118 (59)	132 (61)	0.072
Part time	3 (18)	81 (41)	84 (39)	
Housing				
House, flat, council flat	25 (43)	280 (54)	313 (55)	0.725
Shack & other	33 (57)	234 (46)	259 (45)	
Present within home				
Toilet				
Yes	13 (22)	145 (28)	158 (28)	0.349
No	45 (78)	369 (72)	414 (72)	
Running water				
Yes	23 (40)	208 (40)	231 (40)	0.905
No	35 (60)	306 (60)	341 (60)	
Electricity				
Yes	57 (98)	503 (98)	560 (98)	1.000
No	1 (2)	11 (2)	12 (2)	
Refrigerator				
Yes	49 (84)	417 (81)	466 (81)	0.533
No	9 (16)	97 (19)	106 (19)	
Landline Phone				
Yes	2 (3)	8 (2)	10 (2)	0.269
No	56 (97)	506 (98)	562 (98)	
Television				
Yes	55 (95)	476 (93)	531 (93)	0.788
No	3 (5)	38 (7)	41 (7)	
Total number of people living in home	4 (3-5)	4 (3-6)	4 (3-6)	0.621
Adults, 16 years and older	3 (2-3)	3 (2-4)	3 (2-4)	0.746
Children, 15 years and younger	1 (0-2)	1 (0-2)	1 (0-2)	0.765
Obstetric characteristics				
Current pregnancy intended				
Yes	13 (22)	156 (30)	169 (30)	0.209
No	45 (78)	358 (70)	403 (70)	
Gravidity				
1	7 (12)	93 (18)	100 (17)	0.252
≥1	51 (88)	421 (82)	472 (83)	
HIV history				
Children living	1 (1-2)	1 (1-2)	1 (1-2)	0.570
Children residing with mother	1 (0-2)	1 (0-1)	1 (0-1)	0.402
Children tested HIV+				
Yes	1 (2)	9 (2)	10 (2)	1.000
No	48 (98)	409 (98)	457 (98)	
Currently in a relationship				
Yes	57 (98)	499 (97)	556 (97)	1.000
No	1 (2)	15 (3)	16 (3)	
Disclosed status to partner				
Yes	13 (23)	184 (37)	197 (35)	**0.035**
No	44 (77)	315 (63)	359 (65)	
Disclosed status to anyone				
Yes	22 (38)	265 (52)	287 (50)	**0.049**
No	36 (62)	249 (48)	285 (50)	
Diagnosed				
In this pregnancy	34 (59)	276 (54)	310 (54)	0.476
Before this pregnancy	24 (41)	238 (46)	262 (46)	
ARV use				
Previous PMTCT				
Yes	12 (24)	147 (35)	159 (34)	0.118
No	38 (76)	272 (65)	310 (66)	
Previous ART				
Yes	0 (0)	23 (4)	23 (4)	0.154
No	58 (100)	491 (96)	549 (96)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

† Missing response for 1 participant, n = 572.

Sub analysis of multiparous HIV-infected women who had prior infant feeding experience stratified by their EBF practice during this study.

Data was collected from multiparous participants about previous infant feeding as well as their infant feeding intentions for their current pregnancy (S4 Table). Their infant feeding intentions during this study were collected at the late third trimester visit. This data was stratified by their current EBF practice during this study reported at their first postpartum study visit. There were no significant differences between those who had practiced EBF and those who did not.

S4 Table. Previous infant feeding experience of multiparous HIV-infected women and their intentions for expected infant reported prenatally at the late third trimester interview stratified by exclusive breastfeeding (EBF) practiced during this study reported at or before seven days postpartum.

	Did EBF n (%) or median (IQR)	**Did not EBF** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P-value*
Previous infant feeding experience				
Previous children				
Yes	35 (71)	410 (78)	445 (78)	0.262
No	14 (29)	113 (22)	127 (22)	
Breastfed previous infant(s)				
Yes	31 (89)	316 (77)	347 (78)	0.139
No	4 (11)	94 (23)	98 (22)	
Duration of previous breastfeeding				
<6 months	8 (26)	87 (28)	95 (28)	0.765
≥6 months	23 (74)	220 (72)	243 (72)	
Age at introduction of water or liquids				
<6 months	15 (42)	214 (52)	229 (51)	0.289
≥6 months	20 (57)	196 (48)	216 (49)	
Age at introduction of animal milk or solids				
<6 months	15 (42)	177 (43)	192 (43)	0.971
≥6 months	20 (57)	233 (57)	253 (57)	
Age of last child when anything other than breast milk was introduced				
<6 months	10 (29)	155 (38)	165 (37)	0.278
≥6 months	25 (71)	255 (62)	280 (63)	
Expected infant feeding intentions				
Intending to exclusively BF expected infant				
<6 months	40 (82)	423 (81)	463 (81)	0.919
≥6 months	9 (18)	99 (19)	108 (19)	
Duration intending to breastfeed				
<6 months	4 (10)	65 (15)	69 (15)	0.387
≥6 months	36 (90)	367 (85)	403 (85)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

Sub analysis of multiparous HIV-infected women who had prior infant feeding experience stratified by their BF status reported at or before seven days postpartum.

Prior to this study breastfeeding experience and breastfeeding intention during the study period were stratified by those who had ever breastfed versus women who had never breastfed at any stage during the study period (S5 Table). Previous BF experience was associated with BF intiation during the study period (P = 0.001). A significantly higher proportion of women did initiate BF, and this was associated with having prenatal intentions to EBF (P < 0.001).

S5 Table. Previous infant feeding experience of multiparous HIV-infected women and their intentions for the expected infant reported prenatally at the late third trimester interview stratified by their BF practice reported at or before seven days postpartum.

	Ever breastfed n (%) or median (IQR)	**Never breastfed** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P-value*
Previous infant feeding experience				
Previous children				
Yes	425 (81)	44 (90)	469 (82)	0.137
No	98 (19)	5 (10)	103 (18)	
Breastfed previous infant(s)				
Yes	324 (80)	23 (58)	347 (78)	**0.001**
No	81 (20)	17 (43)	98 (22)	
Duration of previous breastfeeding				
<6 months	88 (28)	7 (35)	95 (28)	0.480
≥6 months	230 (72)	13 (65)	243 (72)	
Age at introduction of water or liquids				
<6 months	207 (51)	22 (55)	229 (51)	0.639
≥6 months	198 (49)	18 (45)	216 (49)	
Age at introduction of animal milk or solids				
<6 months	175 (43)	17 (43)	192 (43)	0.931
≥6 months	230 (57)	23 (58)	253 (57)	
Age of last child when anything other than breast milk was introduced				
<6 months	150 (37)	15 (38)	165 (37)	0.954
≥6 months	255 (63)	25 (63)	280 (63)	
Expected infant feeding intentions				
Intending to exclusively BF expected infant				
Yes	451 (86)	12 (24)	463 (81)	**0.000**
No	71 (14)	37 (76)	108 (19)	
Duration intending to breastfeed expected infant				
<6 months	64 (14)	5 (21)	403 (85)	0.376
≥6 months	384 (86)	19 (79)	69 (15)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

Sub analysis of multiparous HIV-infected women who had prior infant feeding experience stratified by their congruence status reported at or before seven days postpartum.

Data was collected from multiparous participants about previous infant feeding as well as their infant feeding intentions for their current pregnancy at the late third trimester visit (S6 Table). This data was stratified by their congruence status at their first postpartum study visit. Congruence was based on having met their prenatal infant feeding intentions postnatally. There was a significant difference between those who were congruent or incongruent based on their prenatal intention to EBF.

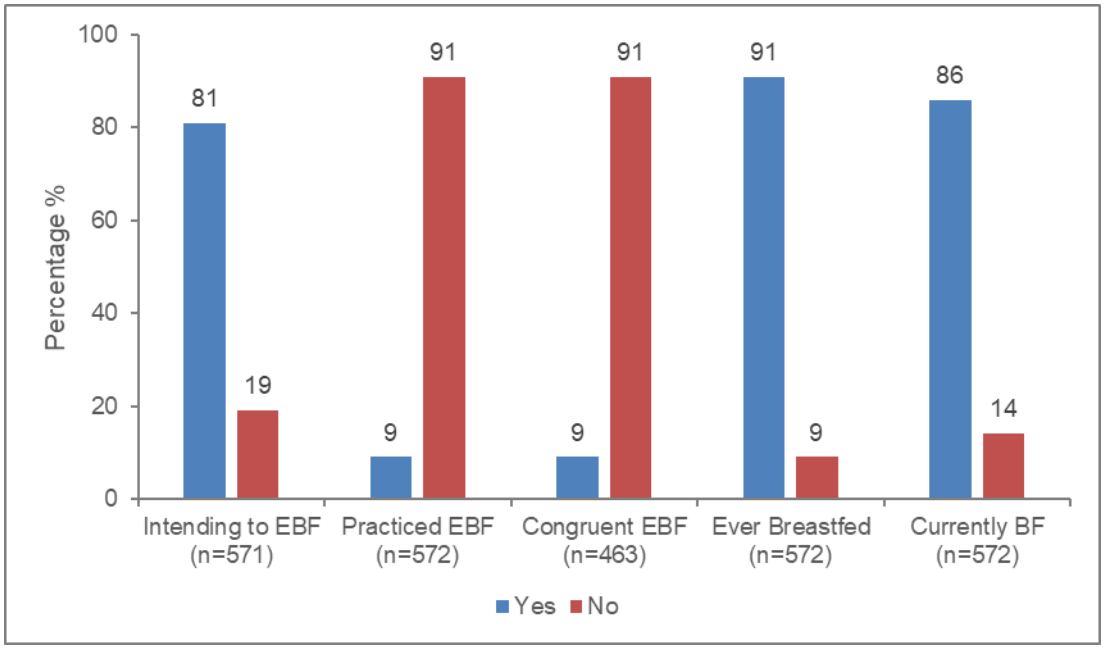
S6 Table. Previous infant feeding experience of multiparous HIV-infected women and their intentions for the expected infant reported prenatally at the late third trimester interview stratified by their congruence status reported at or before seven days postpartum.

	Congruent to feeding intentions n (%) or median (IQR)	**Incongruent to feeding intentions** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P-value*
Previous infant feeding experience				
Previous children				
Yes	46 (79)	399 (78)	445 (78)	0.770
No	12 (21)	115 (22)	22 (127)	
Breastfed previous infant(s)				
Yes	41 (89)	306 (77)	347 (78)	0.054
No	5 (11)	93 (23)	98 (22)	
Duration of previous breastfeeding				
<6 months	13 (33)	82 (27)	95 (28)	0.440
≥6 months	26 (67)	217 (73)	243 (72)	
Age at introduction of water or liquids				
<6 months	21 (46)	208 (52)	229 (51)	0.405
≥6 months	25 (54)	191 (48)	216 (49)	
Age at introduction of animal milk or solids				
<6 months	21 (46)	171 (43)	192 (43)	0.717
≥6 months	25 (54)	228 (57)	253 (57)	
Age of last child when anything other than breast milk was introduced				
<6 months	14 (30)	151 (38)	165 (37)	0.325
≥6 months	32 (70)	248 (62)	280 (63)	
Expected infant feeding intentions				
Intending to exclusively BF expected infant				
Yes	40 (69)	423 (82)	463 (81)	**0.013**
No	18 (31)	90 (18)	108 (19)	
Duration intending to breastfeed				
<6 months	8 (17)	61 (14)	69 (15)	0.575
≥6 months	38 (83)	365 (86)	403 (85)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

Sub analysis of BF intention and practice by HIV-infected women.

BF in some form was intended and practiced by most participants in the study. These data have been presented below in S1 Fig and S7 Table. Eighty one percent (n = 463/571) stated intention to EBF prenatally. At or before seven days postpartum, 9% (n = 49/572) of HIV-infected women reported practicing EBF. The prevelence of congruent EBF was seven percent. If adjusted to include only HIV-infected women who intended to EBF (n = 463), EBF congruence increased to nine percent. When recalculated against the 58 HIV-infected women who did practice either congruent EBF, EFF or MF feeding, EBF congruence increases to 69% (n = 40/58). Ninety one percent (n = 523 / 572) reported having breastfed at some stage postpartum (ever BF) and 86% (n = 490 / 572) reported that they were currently BF at their visit at or before one week postpartum.



S1 Fig. BF related infant feeding intentions and practices of HIV-infected women in Gugulethu, Western Cape. EBF: exclusive breastfeeding. BF: breastfeeding.

S7 Table. Infant feeding intentions and breastfeeding practices.

Breastfeeding Practices	Yes n (%)	No n (%)	Total n (%)
Intended to EBF	463 (81)	108 (19)	571 (100)
Practiced EBF	49 (9)	523 (91)	572 (100)
Congruent EBF	40 (9)	423 (91)	463 (100)
Ever breastfed	523 (91)	49 (9)	572 (100)
Currently breastfeeding	490 (86)	82 (14)	572 (100)

Sub analysis of prenatal infant feeding intentions stratified by congruence.

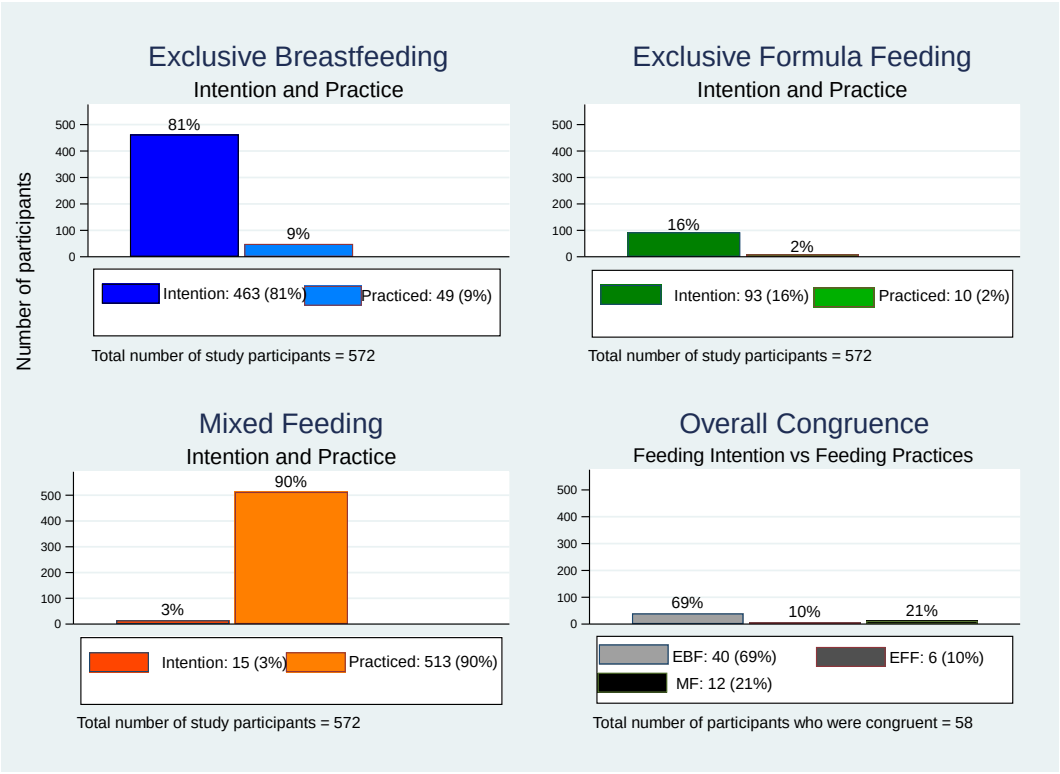
The majority of participants intended to EBF. Few women intended to EFF and MF. Compared to women who did not practice the infant feeding that they intended, women who fed their infants as intended (congruent) were more likely to have intended to EFF (P = 0.002) (S8 Table). For congruence, there 40 women who were congruent in the EBF group, six in the EFF group and 12 in the MF group.

S8 Table. Prenatal infant feeding intentions to exclusively breastfeed, exclusively formula feed or mixed feed stratified by actual postpartum infant feeding practices.

		Practiced n (%) or median (IQR)	**Did not practice** n (%) or median (IQR)	**Total** n (%) or median (IQR)	P-value*
Infant feeding intention					
Exclusively breastfeed					
	Yes	40 (82)	423 (81)	463 (81)	0.898
	No	9 (18)	100 (19)	109 (19)	
Exclusively formula feed					
	Yes	6 (60)	87 (15)	93 (16)	**0.002**
	No	4 (40)	475 (85)	479 (84)	
Mixed feed					
	Yes	12 (2)	3 (5)	15 (3)	0.194
	No	501 (98)	56 (95)	557 (97)	

* Bivariate comparisons using chi-squared and Wilcoxon rank sum tests. Missing data excluded.

Infant feeding intentions and practices can be visualised in S2 Fig. For EBF, 81% of the 572 HIV-infected women intended to EBF prenatally. However, only 9% of the 572 HIV-infected women actually practiced EBF. For EFF, 17% of the HIV-infected women intended to EFF, whereas 2% of the 572 HIV-infected women actually practiced EFF. For MF, 3% of the HIV-infected women intended to MF prenatally but 90% of the entire cohort of 572 HIV-infected women ended up practicing MF. The overall congruence indicates how many of the 58 participants met their intention to EBF (69%), EFF (10%) or MF (21%) postnatally.



S2 Fig. Infant feeding of 572 HIV-infected women in Gugulethu grouped by infant feeding method reflecting the intention, practice and congruence related to each method investigated (n=572). EBF: exclusive breastfeeding. EFF: exclusive formula feeding. MF: mixed feeding. Participants who are reflected as intending and practicing a certain infant feeding method in each feeding method in the figure above and these intentions and practices are not necessarily related to the same individual participants. Overall congruence represents the 58 individual participants who expressed intention to use the same infant feeding method that they practiced.

Appendix E: Journal submission guidelines

From https://journals.plos.org/plosone/s/submission-guidelines

Style and Format

File format	Manuscript files can be in the following formats: DOC, DOCX, or RTF. Microsoft Word documents should not be locked or protected. LaTeX manuscripts must be submitted as PDFs. Read the LaTeX guidelines.
Length	Manuscripts can be any length. There are no restrictions on word count, number of figures, or amount of supporting information. We encourage you to present and discuss your findings concisely.
Font	Use a standard font size and any standard font, except for the font named "Symbol". To add symbols to the manuscript, use the Insert → Symbol function in your word processor or paste in the appropriate Unicode character.
Headings	Limit manuscript sections and sub-sections to 3 heading levels. Make sure heading levels are clearly indicated in the manuscript text.
Layout and spacing	Manuscript text should be double-spaced. Do not format text in multiple columns.
Page and line numbers	Include page numbers and line numbers in the manuscript file. Use continuous line numbers (do not restart the numbering on each page).
Footnotes	Footnotes are not permitted. If your manuscript contains footnotes, move the information into the main text or the reference list, depending on the content.
Language	Manuscripts must be submitted in English. You may submit translations of the manuscript or abstract as supporting information. Read the supporting information guidelines.
Abbreviations	Define abbreviations upon first appearance in the text. Do not use non-standard abbreviations unless they appear at least three times in the text. Keep abbreviations to a minimum.
Reference style	PLOS uses "Vancouver" style, as outlined in the ICMJE sample references.

Equations We recommend using MathType for display and inline equations, as it will provide the most reliable outcome. If this is not possible, Equation Editor or Microsoft's Insert→Equation function is acceptable.

Nomenclature Use correct and established nomenclature wherever possible.

Units of measurement	Use SI units. If you do not use these exclusively, provide the SI value in parentheses after each value. Read more about SI units.
Drugs	Provide the Recommended International Non-Proprietary Name (rINN).

Manuscript Organization

Manuscripts should be organized as follows. Instructions for each element appear below the list.

Beginning section *The following elements are required, in order:*

- Title page: List title, authors, and affiliations as first page of manuscript
- Abstract
- Introduction

Middle section *The following elements can be renamed as needed and presented in any order:*

- Materials and Methods
- Results
- Discussion
- Conclusions (optional)

Ending section *The following elements are required, in order:*

- Acknowledgments
- References
- Supporting information captions (if applicable)

Other elements

- Figure captions are inserted immediately after the first paragraph in which the figure is cited. Figure files are uploaded separately.
- Tables are inserted immediately after the first paragraph in which they are cited.
- Supporting information files are uploaded separately.

Parts of a Submission

Title

Include a full title and a short title for the manuscript.

Title	Length	Guidelines	Examples
Full title	250 characters	Specific, descriptive, concise, and comprehensible to readers outside the field	Impact of cigarette smoke exposure on innate immunity: A *Caenorhabditis elegans* model Solar drinking water disinfection (SODIS) to reduce childhood diarrhoea in rural Bolivia: A cluster-randomized, controlled trial
Short title	100 characters	State the topic of the study	Cigarette smoke exposure and innate immunity SODIS and childhood diarrhoea

Titles should be written in sentence case (only the first word of the text, proper nouns, and genus names are capitalized). Avoid specialist abbreviations if possible. For clinical trials, systematic reviews, or meta-analyses, the subtitle should include the study design.

Author list

Author names and affiliations

Enter author names on the title page of the manuscript and in the online submission system.

On the title page, write author names in the following order:

- First name (or initials, if used)
- Middle name (or initials, if used)
- Last name (surname, family name)

Each author on the list must have an affiliation. The affiliation includes department, university, or organizational affiliation and its location, including city, state/province (if applicable), and country.

Cover letter

Upload a cover letter as a separate file in the online system. The length limit is 1 page.

The cover letter should include the following information:

- Summarize the study's contribution to the scientific literature
- Relate the study to previously published work
- Specify the type of article (for example, research article, systematic review, meta-analysis, clinical trial)
- Describe any prior interactions with PLOS regarding the submitted manuscript
- Suggest appropriate Academic Editors to handle your manuscript (see the full list of Academic Editors)
- List any opposed reviewers

Title page

The title, authors, and affiliations should all be included on a title page as the first page of the manuscript file.

Abstract

The Abstract comes after the title page in the manuscript file. The abstract text is also entered in a separate field in the submission system.

The Abstract should:

- Describe the main objective(s) of the study
- Explain how the study was done, including any model organisms used, without methodological detail
- Summarize the most important results and their significance
- Not exceed 300 words

Abstracts should not include:

- Citations
- Abbreviations, if possible

Introduction

The introduction should:

- Provide background that puts the manuscript into context and allows readers outside the field to understand the purpose and significance of the study
- Define the problem addressed and why it is important
- Include a brief review of the key literature
- Note any relevant controversies or disagreements in the field
- Conclude with a brief statement of the overall aim of the work and a comment about whether that aim was achieved

Materials and Methods

The Materials and Methods section should provide enough detail to allow suitably skilled investigators to fully replicate your study. Specific information and/or protocols for new methods should be included in detail. If materials, methods, and protocols are well established, authors may cite articles where those protocols are described in detail, but the submission should include sufficient information to be understood independent of these references.

Protocol documents for clinical trials, observational studies, and other **non-laboratory** investigations may be uploaded as supporting information. We recommend depositing **laboratory protocols** at protocols.io. Read detailed instructions for depositing and sharing your laboratory protocols.

Human or animal subjects and/or tissue or field sampling

Methods sections describing research using human or animal subjects and/or tissue or field sampling must include required ethics statements. For details, consult the reporting guidelines for specific study types.

Data

For information on how best to provide data, read our policy on data availability. PLOS.

Results, Discussion, Conclusions

These sections may all be separate, or may be combined to create a mixed Results/Discussion section (commonly labeled “Results and Discussion”) or a mixed Discussion/Conclusions section (commonly labeled “Discussion”). These sections may be further divided into subsections, each with a concise subheading, as appropriate. These sections have no word limit, but the language should be clear and concise.

Together, these sections should describe the results of the experiments, the interpretation of these results, and the conclusions that can be drawn.

Authors should explain how the results relate to the hypothesis presented as the basis of the study and provide a succinct explanation of the implications of the findings, particularly in relation to previous related studies and potential future directions for research.

PLOS ONE editorial decisions do not rely on perceived significance or impact, so authors should avoid overstating their conclusions. See the *PLOS ONE* Criteria for Publication for more information.

Acknowledgments

Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution.

References

Any and all available works can be cited in the reference list. Acceptable sources include:

- Published or accepted manuscripts
- Manuscripts on preprint servers, providing the manuscript has a citable DOI or arXiv URL.

References are listed at the end of the manuscript and numbered in the order that they appear in the text. In the text, cite the reference number in square brackets (e.g., “We used the techniques developed by our colleagues [19] to analyze the data”). PLOS uses the numbered citation (citation-sequence) method and first six authors, et al.

Do not include citations in abstracts.

Make sure the parts of the manuscript are in the correct order *before* ordering the citations.

Formatting references

Because all references will be linked electronically as much as possible to the papers they cite, proper formatting of the references is crucial.

PLOS uses the reference style outlined by the International Committee of Medical Journal Editors (ICMJE), also referred to as the “Vancouver” style. Example formats are listed below. Additional examples are in the ICMJE sample references.

Journal name abbreviations should be those found in the National Center for Biotechnology Information (NCBI) databases.

Supporting Information

Authors can submit essential supporting files and multimedia files along with their manuscripts. All supporting information will be subject to peer review. All file types can be submitted, but files must be smaller than 10 MB in size.

Authors may use almost any description as the item name for a supporting information file as long as it contains an "S" and number. For example, "S1 Appendix" and "S2 Appendix," "S1 Table" and "S2 Table," and so forth.

Supporting information files are published exactly as provided, and are not copyedited.

Supporting information captions

List supporting information captions at the end of the manuscript file. Do not submit captions in a separate file.

The file number and name are required in a caption, and we highly recommend including a one-line title as well. You may also include a legend in your caption, but it is not required.

Example caption

S1 Text. Title is strongly recommended. Legend is optional.

In-text citations

We recommend that you cite supporting information in the manuscript text, but this is not a requirement. If you cite supporting information in the text, citations do not need to be in numerical order.

Read the supporting information guidelines for more details about submitting supporting information and multimedia files.

Figures and Tables

Figures

Do not include figures in the main manuscript file. Each figure must be prepared and submitted as an individual file.

Cite figures in ascending numeric order at first appearance in the manuscript file.

Read the guidelines for figures.

Figure captions

Figure captions must be inserted in the text of the manuscript, immediately following the paragraph in which the figure is first cited (read order). Do not include captions as part of the figure files themselves or submit them in a separate document.

At a minimum, include the following in your figure captions:

- A figure label with Arabic numerals, and “Figure” abbreviated to “Fig” (e.g. Fig 1, Fig 2, Fig 3, etc). Match the label of your figure with the name of the file uploaded at submission (e.g. a figure citation of “Fig 1” must refer to a figure file named “Fig1.tif”).
- A concise, descriptive title

The caption may also include a legend as needed.

Read more about figure captions.

Tables

Cite tables in ascending numeric order upon first appearance in the manuscript file.

Place each table in your manuscript file directly after the paragraph in which it is first cited (read order). Do not submit your tables in separate files.

Tables require a label (e.g., “Table 1”) and brief descriptive title to be placed above the table. Place legends, footnotes, and other text below the table.

Read the guidelines for tables.